THE IRON TRADE REVIEW

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Large Tonnages of Pig Iron Sold

Buyers Discourage Covering for First Half of Next Year— Prices Advance Rapidly

GREATLY increased activity and higher prices characterize the market. The Steel Corporation is now operating at full 93 per cent of ingot capacity and 87 per cent of blast furnace capacity. It still has about 20 blast furnaces idle, but some of these are small, isolated stacks and the report that the Corporation is negotiating for a large tonnage of steel-making iron is apparently well-founded, although not officially confirmed.

Pig Iron

Very heavy sales of pig iron have been made in all the leading centers. A conservative estimate places the tonnage at fully 200,000, including 50,000 in Philadelphia and about the same tonnage in New York and Cleveland. While some of the buying has been for delivery during the first half of next year, sellers are discouraging contracting for delivery after Jan. 1, and a considerable part of the iron recently ordered has been for this year. Proof that the melt is increasing is shown by the urgent demand for shipments and by pending inquiries for large tonnages for delivery this year. Very naturally, prices are advancing rapidly and steel-making irons are quoted from 75 cents to $1.25 higher than a week ago. The United States Cast Iron Pipe & Foundry Co. sounded the market on southern iron for next year's delivery and was quoted $12.50, Birmingham. On this year's delivery, the $10.50 quotation has virtually disappeared and some important interests have withdrawn from the market.

Rail Buying

Russia is making final arrangements for the purchase of large additional tonnages of rails and it is understood that details concerning the 100,000-ton lot recently credited to the Cambria Steel Co. have been decided upon and that another mill is working on 100,000 tons additional, while an eastern Pennsylvania mill has been offered 20,000 tons more. France is inquiring for 30,000 tons of rails. The Reading has placed about 10,000 tons of rails, of which 8,000 went to the Pennsylvania Steel Co. The Baltimore & Ohio has ordered 17,000 tons of rails.

Bars

The demand for steel bars is extremely active and in some cases premiums have been offered for prompt delivery. New inquiries include one for 24,000 tons of rounds for the manufacture of shrapnel sent out by a Chester, Pa., concern, which has been figuring on 115,000 tons for delivery extending over two years. Several large rail mills, which until very recently were extremely anxious to take orders for rails, are now being utilized in the rolling of large rounds and are not encouraging the placing of rail orders.

Machinery

Tremendous demand for machine tools from abroad continues, but the volume of business closed is not very large on account of inability to give satisfactory deliveries. One inquiry from a buyer co-operating with J. P. Morgan & Co., is for prices on about 1,000 lathes and other machine tools. The Lehigh and New England railroad has received bids on 40 machine tools for its new shops at Pen Argyle, Pa.

Billets

There is a decided scarcity of semi-finished material, especially open hearth billets, and some fancy prices are being asked. Regular customers in the east are being quoted $32, mill, on limited tonnages of open hearth steel. Italy has bought 7,500 tons additional rail crop ends at an advance of $3.75 over the price recently paid.

Ferro Manganese

Owing to the continued uncertainty as to shipment of ferro-manganese from England, prices are much firmer and some makers are quoting $132, seaboard, for early delivery, although some English makers are willing to accept further orders at $100, seaboard, for such delivery as they may be able to make.

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No Boycotting by Employer or Employe

THE action of the attorney general of the United States in taking an appeal to the supreme court from the decision of the district court in the dissolution suit against the Keystone Watch Case Co., seems to be in line with the general policy of the government to carry to the highest court the important cases recently decided in which the so-called anti-trust laws are involved. It is, we believe, well to have the highest tribunal in the land pass upon these cases, but in the suit against the Steel Corporation and the Watch company, one naturally wonders whether the government has any hope that any part of the decisions will be reversed.

In the Watch company case, the decision was by Judges Buffington, Hunt and McPherson, circuit judges, who, with Judge Woolley, sat in the Steel Corporation case. If anyone imagines that the three judges are incapable of seeing wrong-doing in a big corporation, he will be disabused of that impression by reading the decision in the Watch company case. The judges review the history of the company, showing how it gradually became a powerful concern. There was no doubt that the growth was due in part to acquiring or controlling other plants, but the court found that it had not acquired them by improper methods, and had not used its acquisitions improperly. There was no concealment about its growth, the trade was well informed about its operations, its plants were enlarged or improved, the volume of production was increased, prices were not inflated, competitors were not unlawfully attacked, and the court found nothing to condemn until the company attempted a boycott. But beginning in about 1904, it made several attempts which, in the opinion of the court, showed a definite purpose to restrain trade by attempting to fix and maintain prices and by using a kind of boycott or blacklist in order to lessen the trade of its rivals. This boycotting plan was announced in several ways, and very plainly stated in a circular dated Jan. 15, 1910. In discussing the question, What is unreasonable restraint of trade?—the court said that competitors must not be oppressed or coerced; fraudulent or unfair or oppressive rivalry must not be pursued; prices must not be arbitrarily fixed or maintained; an artificial scarcity must not be produced; both the public and the employes must be fairly treated; but the court made it clear that a company cannot be condemned merely because of its size. The judges found no justification for dissolving the Watch company, but declared that the boycott must be stopped and ordered a decree in accordance with the principles laid down.

The decision establishes the square deal doctrine so clearly that the government can hardly expect the supreme court to take a contrary view. Certainly, the government will not complain because the court has applied to the Watch company the same doctrine that was proclaimed by the supreme court in the Danbury hatters' case; that is, that the boycott cannot be tolerated. We believe that the action of the district court in refusing to dissolve the Watch company, and also in compelling it to abandon its boycott, will be sustained.

Will the Flag Come Down?

SECRETARY McADOO made a speech the other day at Greensboro, N. C., which was disappointing to those who had hoped that the administration had given up the idea of insisting upon the passage of the bill providing for government ownership of ships to engage in foreign commerce. An abstract of the speech published in many newspapers of the country had the right ring to it, for it emphasized the necessity of the United States having adequate merchant marine. But in a more extensive report of the speech carried by a few of the large newspapers, this paragraph is found:

"It is simply fatuous to hope that private capital will provide these ships. Private capital will not provide them, even if the navigation laws, about which there is so much irresponsible talk, should be changed as private capital demands. We cannot afford to enter upon the scandalous policy of subsidizing private corporations or individuals."

This paragraph seems clearly to indicate that the secretary is adhering to the shipping bill recently disapproved by an overwhelming vote of the chamber of commerce of the United States. The bill was regarded as highly socialistic and objectional and the vote of the chamber was overwhelming against it. But Secretary McAdoo seems determined to push it through congress if he can possibly do so.

How does the secretary know that private capital will not provide American ships? Does he believe, as Ex-Senator Burton does, that the American people are not sea-going folk and for that reason cannot be depended upon to establish an American merchant marine? Even with the present abominable navigation laws, ship building, owing largely to conditions growing out of the European war, is prospering. If the navigation laws can be modified and the upbuilding of the American merchant marine be given reasonable encouragement in other ways, the ships now being built and many others will be operated under the starts and stripes. But if Secretary McAdoo has the backing of the administration and succeeds in preventing the adoption of a fair and patriotic

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policy, he will cause the owners of countless numbers of ships to haul down the American flag and hoist that of China or some other foreign country. He may be sure of one thing; that is, that the new congress, which will assemble in December, will not pass the bill providing for government ownership of the merchant marine.

Simultaneous Vacations

DOUBTLESS many employers, when they heard the other day that Henry Ford had decided to give all the employes of the Ford Motor Co.'s plant at Detroit a two weeks' vacation at the same time, wished that they could also close their plants and get through with the vacations. Certainly, it is true that when substitutes are on duty throughout the plant or office, things do not move as smoothly as when those who have had long experience with their jobs are on duty. The proprietor or head of the department would indeed be unreasonable to expect the same degree of efficiency from inexperienced employes as from those thoroughly familiar with the work. But, after all, it is a pretty poor sort of an organization which is not provided with understudies who can do their work fairly well. The vacation period affords an opportunity for trying out many employes in more responsible positions than they usually occupy.

Some plants, of course, could be closed as Mr. Ford's has been, except that a few employes could be kept on duty, making repairs and getting the plants ready to resume activity, but with many concerns a complete shut-down would be highly inconvenient, if not impossible, and much better results are obtained by the usual plan of the employes taking vacations at different times.

Helping Men to Help Themselves

ONE NIGHT last week, 150 miners were the guests of the city of Cleveland. Through cooperation of state and city officials, the men had been brought from Ohio mines after having been idle for many months. Two thousand idle men, nearly all of whom had families who were approaching starvation, had heard the glad news that in Cleveland 150 jobs were awaiting filling. The question was, how would the jobs be distributed? The 2,000 names were put in a hat and the 150 men who drew the lucky numbers started for the Sixth City. After spending a night at the city armory, the men were sent out to work in various factories, whose managers had been advertising in vain for common labor at $2 per day. Supt. Hennessey, of the city-state employment bureau, says that the men are happy, that the employers are pleased with their work, and that there are more jobs for idle miners in Cleveland. From different parts of Ohio, and also Kentucky, employers who have heard of the success of the Cleveland experiment are inquiring how they can get some miners, and the outlook is very encouraging for all of the men who still are idle in the Ohio coal regions.

This, we believe, is real public service, worthy of hearty commendation. There is no tinge of charity in it. It is simply transferring workers from a district where there are more men than jobs to a district where there are more jobs than men.

A press telegram from San Francisco announces that an advisory board of 12 men, representing equally the federal, state and municipal governments of the country, to bring about closer co-operation in dealing with problems of employment and unemployment, was named last Friday at the closing session of the United States department of labor conference on employment. If this board will act with the sound common sense which has characterized Governor Willis, of Ohio, and those state and city officials who have co-operated with him in finding work for Ohio miners, it will prove one of the most useful bodies ever organized in this country.

Pioneer in Welfare Work

NOWADAYS it has become very popular to engage in welfare work, which with some people is almost a fad. We say this without intending to reflect in any way upon the thousands of high-minded men and women who are giving time, thought and energy to making the lot of employes in great industries more healthful and pleasant, but even greater credit is due to the pioneers in welfare work—men like William Lynch, who passed away a few months ago, and George G. McMurtry, whose long and useful life has just come to a close. Mr. McMurtry studied earnestly town plans and welfare work of various kinds and decided that the best service he could render the employes of his company would be to furnish them a town of good homes and good schools. This he did, and Vandergrift, Pa., is an enduring monument to his memory. His efforts brought to the new town a very high grade of workmen and his policy proved to be wise from a business standpoint as well as humane. His social betterment ideas were entirely consistent with his many plans for the upbuilding of the great industry with which he was so long prominently identified.

Prices Present and Past

Quotations on leading products August 11, average for July, 1915, average for May, 1915, and average for August, 1914. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Aug. 11, 1915.	Average for July, 1915.	Average for May, 1915.	Average for Aug., 1914.
Bessemer pig iron, Pittsburgh..	$15.90	$14.88	$14.55	$14.90
Basic pig iron, Pittsburgh.....	14.90	13.88	13.45	13.90
No. 2 Fdy. pig iron, Pittsburgh	14.45	13.60	13.45	13.90
Northern No. 2 Fdy., Chgo....	13.50	13.00	13.00	14.00
Lake Superior Charcoal, Chgo..	15.75	15.55	15.25	15.75
Mall., Bess., Chgo.....	13.50	13.00	13.00	14.00
Southern No. 2, Birmingham...	11.00	9.75	9.50	10.00
Southern Ohio No. 2, Ironton.	13.50	12.75	12.75	13.50
Basic, eastern Pa.....	15.00	13.85	13.25	14.00
No. 2X Virginia furnace.....	12.50	12.50	12.50	12.50
No. 2X foundry, Philadelphia..	15.00	14.40	14.25	14.75
Ferro mang., Balt., (prompt)..	100.00	101.20	100.00	125.00
Bessemer billets, Pbgh.....	23.00	21.40	19.50	20.00
Bess. sheet bars, Pbgh.....	24.00	21.70	20.00	21.00
Steel bars, Chicago.....	1.49	1.46	1.39	1.36
Steel bars, Pittsburgh.....	1.30	1.26	1.20	1.175
Iron bars, Philadelphia.....	1.40	1.20	1.17	1.20
Iron bars, Cleveland, local del'y.	1.20	1.20	1.15	1.20
Iron bars, Chgo. mill.....	1.25	1.20	1.15	1.07

	Prices Aug. 11, 1915.	Average for July, 1915.	Average for May, 1915.	Average for Aug., 1914.
Beams, Chicago	$ 1.49	$ 1.46	$1 .34	$ 1.36
Beams, Pittsburgh	1.30	1.26	1.20	1.175
Beams, Philadelphia	1.459	1.359	1.359	1.30
Tank plates, Pittsburgh.....	1.30	1.22	1.125	1.16
Tank plates, Chicago.....	1.44	1.39	1.29	1.36
Tank plates, Philadelphia.....	1.459	1.359	1.359	1.30
Sheets, blk., No. 28, Pbgh.....	1.85	1.77	1.80	1.88
Sheets, blue an., No. 10, Pbgh.	1.35	1.35	1.35	1.375
Sheets, galv., No. 28, Pbgh....	4.00	4.55	3.40	2.85
Wire nails, Pittsburgh.....	1.60	1.59	1.55	1.55
Connellsville fur. coke contr...	1.75	1.67	1.65	1.80
Connellsville fdy. coke, contr...	2.25	2.25	2.25	2.36
Heavy melting steel, Pbgh.....	13.00	11.75	11.75	11.50
Heavy melting steel, east'n Pa.	12.50	12.00	11.31	10.50
Heavy melting steel, Chgo.....	11.50	10.15	9.25	9.50
No. 1 wrought eastern Pa.....	13.50	13.00	12.50	12.50
No. 1 wrought, Chgo.....	9.75	8.90	8.75	8.75
Rerolling rails, Chgo.....	11.50	10.00	10.00	11.25
Car wheels, Chgo.....	11.00	10.30	9.75	11.00

(For Additional Prices See Page 332.)

Pig Iron Prices Advanced Rapidly

Considerably Higher Quotations Follow Large Sales and Insistent Efforts of Melters to Cover for First Half Requirements

New York, Aug. 10.—A lively market for pig iron is proceeding steadily in this territory. On all sides, consumers are taking up any lots they may require to fill out their needs to the year's end, and they are bringing an increasing pressure upon the makers to cover them for first quarter and first half. The furnaces are coming around to doing this slowly, as the market has been moving rather swiftly and there is a good deal of uncertainty as to just what prices should be named. In some cases, Pennsylvania makers have quoted $1 advance over the current market for first half delivery. Buffalo furnaces in the week sold some tonnage in this territory for shipment after Jan. 1 at $14, furnace basis for No. 2X. For this year, sales of eastern Pennsylvania at $14.75, furnace, for No. 2X, or $15.49, tidewater, were made the past few days. The present tidewater range is about $15 to $15.50 for No. 2X. The Virginia Iron, Coal & Coke Co. has advanced No. 2X for this year's delivery 50 cents to $13.50, furnace, leaving other grades unchanged. Sales of the week in this district reached about 50,000 tons and the present inquiry is 30,000 to 40,000 tons. A Phillipsburg, N. J., pipe maker bought 7,000 to 9,000 tons of mixed grades for this year and is in the market for 3,000 to 4,000 tons for first quarter; the Central Foundry Co. took 5,000 tons of foundry for shipments running into next year, delivery to be made to a New Jersey and to a New York state plant. Other sales include 1,000 tons of foundry to a Jersey City stove manufacturer and 2,500 tons of foundry to the Delaware, Lackawanna & Western railroad for Scranton, Pa. About 15,000 tons additional of steelmaking and southern foundry were taken here in the week by speculators. The United States Cast Iron Pipe & Foundry Co. has sounded the market on a block of 50,000 tons of southern iron for next year and was quoted $12.50, Birmingham, by leading makers. A St. Louis steel maker took figures on 10,000 to 15,000 tons of basic. A Port Chester maker asks 3,000 tons of foundry for last and first quarter. In export, 1,000 tons of valley bessemer for Italy was sold at $14.50, furnace, and 3,000 tons of No. 2 soft southern have been up for Genoa, Italy. The Port Henry furnace will resume in September.

Buffalo Market Advances

Buffalo, Aug. 10.—The pig iron market in the Buffalo territory has reached the point where the furnaces are not particular about booking further orders for delivery over the remainder of the year. With the turn of the week $14 iron has appeared again in this market after a long period of bottom and low level prices. The maximum quotation of a week ago has become the minimum of the current week. The range is now $13.50 to $14.25. Several sales involving about 500 tons each on recent quotations have been made at $14 for No. 2X foundry. The placement for the week amounted to 15,000 to 20,000 tons.

Producers say that it is only a question of time when $14 will be the minimum for all grades, whether for prompt shipment or for delivery over the remainder of the year. At present $13.50 is the best obtainable price on No. 2X foundry for prompt specification and $14 for forward shipment.

The consumption is apparently increasing, as shipments are going forward in greater volume from the furnaces. In many instances users have doubled their quotas of iron specified. The record drive earlier in the year apparently covered but partially the needs of many melters. In one case, a foundry that bought 1,100 tons for delivery over the remainder of the year, on a conservative estimate of

(*For complete prices see page 332.*)

its needs, specified for the last carload by the end of June.

Producers also report that it has been their previous experience to have an advance in prices cause a reaction in the buying, but in the present market users are coming forward and taking hold even at the higher quotations made to them. There is little disposition on the part of the furnaces to sell into 1916 and the $14 minimum for early in next year is reluctantly quoted as the furnaces are confident that even better prices will prevail.

Pig Iron Prices Advance

Pittsburgh, Aug. 10.—The pig iron market in the Greater Pittsburgh district is somewhat excited. The United States Steel Corporation, which had been an important factor in the market for billets and sheet bars until a few weeks ago, has been figuring for a large tonnage of steel-making pig iron. It is not known definitely whether the Corporation has closed any contracts. Numerous lots of basic have been sold at $14, valley, or 50 cents above the price ruling a week ago. A Chicago melter has closed for about 1,000 tons, valley basic, at $14, furnace. Bessemer is commanding $15, valley. Rather heavy tonnages of this grade are being shipped to Italy, but sellers are refusing to quote on new inquiries for export. Foundry grades also show strength. The Standard Sanitary Mfg. Co. has closed for 20,000 tons of northern foundry and forge pig iron for shipment the first six months of next year to plants in the north. It is understood $13.25, valley, was paid for No. 2 foundry. The Sanitary company also purchased 5,000 tons of southern foundry iron for its Louisville, Ky., plant. The Shenango Furnace Co. will blow in its No. 4 blast furnace, within the next fortnight Other stacks to be blown in very soon are Emma, of the American Steel & Wire, at Cleveland, and the second stack of the Toledo Furnace Co., Toledo, O.

Basic Jumps in East

Philadelphia, Aug. 10.—Under sales totaling at least 50,000 tons in Philadelphia and surrounding territory, the past week, the pig iron market has moved rapidly towards higher prices and more general solidity. A heavy and widespread inquiry continues to come out and it finds the furnaces standing firmly for higher prices for this year and with small inclination to commit themselves on shipment after January while the situation is changing so swiftly in their favor. The net market result of the week's development is an average general advance of 50 cents, with some grades adding fully $1. Basic has been the headliner in this improvement and about 20,000 tons for this year's delivery were sold at $15 delivered eastern Pennsylvania representing a clean advance of $1 a ton. The Phoenix Iron Works Phoenixville Pa., took 10,000 tons, another buyer 6,000 tons and there were other lots at this price. In addition, speculators in this territory closed for about 10,000 tons of western basic which will be held in store. A 10,000 to 12,000-ton inquiry for basic for this year is pending for an eastern Pennsylvania steel marker who already had bought heavily. The situation in basic appears very strong, as some makers are oversold and others are behind in their shipments. Certain makers who have some tonnage to offer now are asking $15.50 delivered. Low phosphorus also shows strength, as makers are well booked. The Midvale Steel Co. bought 5,000 tons from an eastern Pennsylvania maker. Another sale of 1,000 tons is noted. Prices are firm but unchanged. Foundry iron is more active and higher. Some eastern Pennsylvania makers ask $14.75, furnace, for No. 2X, $14.50 for No. 2 plain and $14.25 for No. 3 The Philadelphia market has hardened to about $15 to $15.25 for No. 2X. Virginia iron is unchanged at $12.50 to $13 for No. 2X, but looks better. The Pennsylvania railroad asks 3,500 to 4,000 tons of foundry and charcoal for last quarter delivery at Altoona. A 3,000-ton southern inquiry is out. Cast iron pipe makers in eastern Pennsylvania and Delaware river territory are larger buyers. One took 2,000 tons of mixed Virginia iron in stock at $14.75, delivered. Other negotiations, some for heavy lots, are open. A rolling mill took 1,500 tons of standard forge. This grade now is $14.25 to $14.50, delivered eastern Pennsylvania.

Selling at High Prices

Birmingham, Ala., Aug. 10.—Spot pig iron has advanced to $11 for No. 2 foundry, Birmingham, and is strong at that quotation. Some 20,000 tons have been sold at $12.50 for first half delivery during 1916. Two local makers are out of the market completely, and the entire stocks of the district are said to be not over 175,000 tons, the most of which is held by one company.

The Tennessee Coal, Iron & Railroad Co. this week expects to place in blast No. 4 furnace at Bessemer, which will make 20 furnaces out of a possible 31 in operation in the Birmingham district. Shipment on old orders is good. Every maker in the district states he has already oversold his make for the remainder of this year and the indications are that the advance in the market will continue. By the opening of the new year $13 and probably $14 iron is expected by industrial men.

The greatest activity prevails throughout the industrial district, and August for the first time in two or three years will show normal pay rolls, it is stated.

One maker during the month has refused an offer of 20,000 tons at $10.75, and sales during the coming week at $11 are expected to be very good. Buyers appear anxious to cover, apparently believing that the market is destined to go much higher.

Good Basic Sales

Cincinnati, Aug. 10.—Southern iron is gradually advancing, and $11, Birmingham basis, for No. 2 foundry, is now the prevailing quotation for the last half. A little iron at $10.50, Birmingham basis, might still be had from one furnace, but it comprises such a small tonnage that it will be disposed of within a day or so. Only one stack has shown any inclination to quote into the first quarter of next year, and will take a limited amount of business at $12.50, Birmingham basis, for that delivery. Sales of basic iron into this territory during the past two weeks aggregate about 100,000 tons, and are as follows: The American Rolling Mill Co., Middletown, O., 40,000 tons; the Andrews Steel Co., Newport, Ky., 30,000 tons; the Whitaker-Glessner Co. Portsmouth, O., 20,000 tons, and the Kokomo Steel & Wire Co., Kokomo, Ind., 15,000 tons. The Ohio Malleable Iron Co., Columbus, O., has taken 10,000 tons of malleable iron from Columbus furnaces for the first half, which is also the deliveries specified in the above basic sales. Southern Ohio No. 2 foundry is quoted at from $13.50 to $14, Ironton basis, for the last half, with only a little iron available at the lower figure. The prevailing price for the first half is $14, Ironton basis. Three southern and two southern Ohio stacks are out of the market. Silvery iron is strong at from $16 to $16.50, furnace, for 8 per cent silicon. The only weak spot in the market is the lack of demand for prompt shipment iron, and several lots that have been put upon the market recently have not found ready buyers. Demand at present is mostly for the first half. Dealers are figuring on 4,500 tons of southern iron for the first half in northern Ohio, and a Michigan melter is asking for 1,200 tons of silvery

(For complete prices see page 332.)

iron. A southern Ohio user wants 1,000 tons of special prompt shipment iron and an Iowa manufacturer is out for 1,000 tons of foundry iron for the first quarter.

Active at Cleveland

Cleveland, Aug. 10.—During the 10 days of August, Cleveland agencies have sold fully 50,000 tons of pig iron. This tonnage has been made up of a very large number of moderate orders, and a few fair sized, including part of the tonnage of basic purchased last week by a Kokomo, Ind., melter. A considerable part of the sale of iron was for delivery this year. This indicates that the melt is increasing. Further evidence that the purchases made by consumers are not adequate to meet requirements is shown by pending inquiries, including one for from 5,000 to 10,000 tons of basic from the American Steel Foundries for delivery at its St. Louis plants.

Cleveland furnaces have advanced their quotations and are now quoting $14.25 to $14.50, delivered Cleveland, for No. 2 foundry, malleable and basic, while for last half of this year $14, delivered Cleveland, is adhered to. For delivery outside of Cleveland, practically the same quotations are being made, but in case of keen competition they would probably be shaded 25 cents. Southern Ohio and southern furnaces are showing a very firm attitude in quoting on inquiries from this district, and in some cases have declined to quote. Several southern interests are out of the market.

Strong at St. Louis

St. Louis, Aug. 10.—A sale of 15,000 tons of northern and southern iron, about half of each kind last week, is the largest transaction that has taken place in this territory for quite a while. The iron was purchased for delivery over the last quarter. A number of small-lot sales of southern iron also were made. The American Steel Foundries is in the market for 5,000 to 10,000 tons of basic for last half and there is an inquiry in the market for 3,000 tons of malleable. The market is very strong. Some furnaces have withdrawn their quotations, and others are holding firm at $10.50 to $11, Birmingham. One sale was made today at $11. Northern iron is held at $13.50, Chicago, while Ohio iron has been withdrawn from the market.

Chicago Market Strong

Chicago, Aug 10.—Many indications support the opinion that the pig iron market in this district is strong and that the recent advance from $13 to $13.50, Chicago furnace, is only a start on the upward progress of this product. Sellers believe, from all signs, that another advance is likely to follow shortly. One sign is an increased demand for foundry coke, indicating increasing activity among foundries in general, which is of great significance in reflecting domestic conditions as apart from activity following export demand for war purposes. Strength in the southern market, which has carried that iron to a point too high to compete successfully with local irons, is another factor, the margin at present being sufficient to allow a further increase on northern grades.

Nothing less than $13.50, Chicago furnace, is being quoted on northern No. 2 foundry, basic and malleable, and for first quarter of 1916 the quotation is $14, Chicago furnace, with some sales already booked for that option. Probably the tonnage for that delivery is not large.

Northern sellers are insisting on full premiums for added silicon and are giving no advantage in winking at the analysis to obtain business. One maker who has sold a large tonnage for last half has withdrawn quotations from all selling agencies and will sell only through the central agency with much circumspection.

Large basic inquiry is pending, two melters asking figures on about 10,000 tons each, for delivery in the neighborhood of St. Louis. A recent representative sale was in that territory, involvng 15,000 tons of basic, one-third being southern and the remainder divided between a northern merchant and a northern steel furnace. The northern iron was sold at $13.50, Chicago furnace, indicating the strength of the market on the advance.

Southern iron is strong at $11.50, Birmingham, with some dealers asking more and many furnaces out of the market for last half. Not much interest is manifested here in southern iron, as the price is too high to compete with northern. The position of furnaces in the Birmingham district as to tonnage booked seems to be more than comfortable and no desire to sell further is evident. Two interests refuse to book more than 100 tons at a time from any one buyer.

Iroquois Iron Co. will blow in a second stack late this month to furnish iron already engaged and further additions to merchant capacity probably will follow shortly.

Acquires Meriden Company.—The New England Westinghouse Co., a Massachusetts corporation, has added another concern to its number in order to take care of its large order to furnish military rifles for the Russian government. It has bought the factory and equipment of the Meriden Arms Co., Meriden, Conn., employing about 500 hands. Possession is to be given at once and plans made for increasing the producing capacity. The business will be directed from the Springfield, Mass., headquarters.

(*For complete prices see page* 332.)

Coke Quiet

Some Operators Refuse to Sell for Future Delivery

Pittsburgh, Aug. 10.—The market for Connellsville fuel is quiet. Operators have failed to advance prices to higher levels. Several selling interests are refusing to sell for future delivery at prevailing quotations. Reports of spot furnace fuel selling at less than $1.60, ovens, have not been verified. The market for 72-hour coke is unchanged in position. The *Connellsville Courier* says production the week ending July 31 was 377,410 tons, an increase of 10,315 tons compared with the week before.

Gas Company Inquiry

Philadelphia, Aug. 10.—The United Gas Improvement Co., of this city, is in the market for 40,000 tons of coke for water gas practice for delivery at various plants in the central west.

Outlook Good

Cincinnati, Aug. 10.—The coke market is strong and prices are stationary following a slight advance last week.

The contemplated blowing in of several southern Ohio and southern stacks has indicated a better future for furnace coke, and shipments on yearly contracts of foundry grades are very heavy and fully up to expectations. More furnace coke has been sold in this district during the past six months than in years, and before the end of the year this tonnage will probably be equaled. Consumption is about equal to shipments.

Gaining Strength

St. Louis, Aug. 10.—Coke seems to be gaining strength with 72-hour foundry grades held at $2.50 for any delivery. There is no inquiry for coke in the market.

The American Tool Works Co., Cincinnati, has enlarged its plant by placing a number of machines in the old adjoining building of the Greenwald foundry which it recently purchased for $60,000. This move was made necessary by the crowded condition of the present factory and the large number of orders on the books of the company.

New Inquiry for Bars

Includes 24,000 Tons for Munitions—Offer of Premium for a Bar Mill Product Made in East

Philadelphia, Aug. 10.—A new inquiry for 24,000 tons of rounds for a Chester Pa. company which has been formed to manufacture ammunition has been put out. The Pennsylvania Steel Co. has booked 4,000 tons of 1⅛-inch rounds for 1,000,000 rifle barrels to be manufactured by the Westinghouse Electric & Mfg. Co. at Chicopee Falls, Mass. The Carnegie Steel Co. has taken about 5,500 tons of 3¼-inch rounds for 1,000,000 shrapnel shells to be furnished Russia by the Bartlett-Hayward Co., Baltimore, Md Prices for large rounds remain strong at 2.50c to 3c, mill. Ordinary buyers of bars not fully covered by contract are finding more difficulty in getting material from the mills in view of the filled-up condition of the latter. One of them offered several dollars premium to an eastern maker for a bar mill product this week, but it could not be accepted. Some of the larger makers will not permit their outside offices to take on any further tonnage, although they still nominally quote 1.30c, Pittsburgh. Others who will sell sparingly quote from 1.30c to 1.35c, depending on the lot, buyer etc. Deliveries still fall back and range from four to six weeks except on large rounds, which are much more extended.

Shafting has been advanced $1 a ton further to 65 off in carloads and 60 off in less than carloads. The government is asking for 370 tons of square twisted bars for Panama.

Adopt Pittsburgh Base

Philadelphia, Aug. 10.—Eastern bar iron makers have taken an important action in adopting the Pittsburgh base in quoting their product as well as the quantity differentials now in force on steel bars. These differentials are 15 cents per 100 pounds, or $3 per ton net extra on quantities of 1,000 to 2,000 pounds and 35 cents per 100 pounds, or $7 per ton net extra on less than 1,000 pounds. Heretofore, eastern makers have been quoting mill prices and there has been no uniformity in quantity extras. Some of the larger makers now are quoting 1.25c, Pittsburgh, base, or 1.409c, Philadelphia, which, in fact, is an advance of $3 to $4 a ton over the prices which recently have been ruling. The demand for bar iron recently has been improved considerably and has been accelerated by the falling behind of deliveries with the steel bar mills. Higher prices for scrap also have been another factor in stimulating advances by the mills.

Steel Bars Strong

Chicago, Aug. 10.—Steel bars continue strong at 1.49c, Chicago mill, with a tendency on the part of mills whose capacity is well sold to advance to 1.54c, Chicago mill, on slight provocation. Specifications are coming in large volume and rolling schedules are full. Implement makers, who started operations earlier than usual this summer on advice of steel men who saw heavy tonnages coming, are taking large quantities of steel and are specifying sufficiently far ahead to avoid delays in delivery which would hamper their operations.

No deviation from the established quotation is found. Little new tonnage is coming out, as most users are well covered for the remainder of the year.

War Orders Heavy

Pittsburgh, Aug. 10.—Thousands of tons of steel bars are being sold for the manufacture of war material and some large contracts have been placed recently, but details are not known. Mills are unable to promise larger sizes of rounds for anything like nearby shipment and deliveries of smaller sizes to purely domestic consumers are deferred several months. Steel bars are firm at 1.30c and it is believed 1.35c will be asked before the close of the month. The usual extras for reinforcing bars are being asked by more important mills, although reports of extras being waived when attractive tonnages are involved continue to be heard.

Deliveries Extended

Buffalo, Aug. 10.—The market is strong at 1.30c, Pittsburgh, for prompt shipment with little disposition on the part of mills to quote at this time on last quarter needs. Deliveries are becoming more and more extended, some agencies being unable to do better than 60 to 90 days. One interest reports it is sold up practically solid for the remainder of the year and is ready to withdraw from the market.

Strong in Cleveland

Cleveland Aug. 10.—The bar market continues very strong. The Upson Nut Co. has its five open hearth furnaces in operation and its finishing mills are operating to full capacity. A large part of this company's bar product is going into the nut and bolt department of the company.

In the bidding on the construction of the water works at Cambridge O., the C. P. O'Reilly Co., Navarre building, St. Louis, was low on the excavation, reinforced and sheet piling. About 150 tons of reinforced bars, 150 tons of rail to be used in reinforcing and 300 tons of sheet piling will be required.

Bar Iron Advance Holds

Chicago, Aug. 10.—Recent advance of bar iron from 1.20c to 1.25c, Chicago mill, by one interest has been followed by others and the quotation seems firmly fixed. The change had the effect of bringing out some new business and there has been some improvement of demand from agricultural implement builders and other sources, though this is not marked. With delivery on steel bars being deferred steadily, it is believed iron bars will be used to greater extent and thus help the market in that product. Mills are operating somewhat in excess of 50 per cent with prospects of the schedule being enlarged soon.

Offer Premiums

New York, Aug. 10.—Some buyers appear to be in a difficult position to get prompt deliveries on ordinary soft steel bars and they are offering good premiums for such accommodation. Eastern Pennsylvania makers, who have only limited tonnages of such product to offer in the week, refused offers of 1.55c, mill, and higher, from regular customers. One of these lots involves 700 tons. All the larger mills are making new sales sparingly at 1.30c, Pittsburgh, owing to their heavy bookings and to the receding deliveries. Where they quote at all, some makers ask 1.35c, Pittsburgh, or 1.419c, New York. Large negotiations for shell rounds continue. A 100,000-ton lot for France is pending and there are other tonnages in the market.

Hoops, Bands, Shafting

Pittsburgh, Aug. 10.—Cold rolled steel shafting is being held uniformly at 65 per cent off list for carload lots and it is not improbable further price advances will be announced before Sept. 1. Specifications are heavy and some new buying is enjoyed. Most mills have enough tonnage on their books to assure maximum operation the remainder of the year. Specifications for hoops and bands are coming out in good volume and prevailing prices are firmly maintained.

(For complete prices see page 332.)

Still More Boat Orders

Important Eastern Mill Swamped With Plate Orders —Many Others in Similar Condition

Philadelphia, Aug. 9.—Another merchant boat requiring 5,000 tons of steel, principally plates, has been placed with the Cramp ship yard. This increases the total awards of merchant ships of size to eastern yards to 50. Many more vessels are in the market. Eastern mills will furnish 1,600 tons of plates for the third tracking of the Myrtle avenue elevated line, Brooklyn, which has been taken by the Phoenix Bridge Co. The eastern Pennsylvania situation continues to show steady expansion. One mill needs five weeks for deliveries, although operating at the highest possible point. Other makers are in a somewhat easier position, but are very full for the third quarter. All talk of price cutting has disappeared. The present market is 1.30c, Pittsburgh, or 1.459c, Philadelphia, with an inclination towards 1.35c, Pittsburgh. One maker asks $2 advance for fourth quarter.

Gaining Ground

Pittsburgh, Aug. 10.—Steel plates are being held at 1.30c by mills in the Greater Pittsburgh district and it is not improbable a 1.35c quotation will be announced before the end of the month. Specifications are fairly heavy and some new buying is enjoyed. With few exceptions, mills in this district are deferred in deliveries of steel plates.

Slow Delivery

Buffalo, Aug. 10.—Mills and agencies of the district report prices firm at 1.30c and deliveries extended to four to five weeks.

Plates Regain Position

Chicago, Aug. 10.—Steel plates finally appear to have reached a position as to price practically equal to bars and shapes. A local independent quoting 1.44c, Chicago mill, last week has advanced plates to 1.49c, Chicago mill, at present, which removes the last weak spot with the exception of some competition from Ohio and Pennsylvania which seems to have persisted.

A St. Paul seller reports meeting prices of 1.10c, Pittsburgh, on plates for delivery in the northwest.

Wire Demand Better

Pittsburgh, Aug. 10.—The domestic market for wire products continues to show moderate improvement, but no important change in the situation is expected until after Sept. 1. Inquiries for shipment abroad are increasing in volume. South American, far eastern and belligerent European nations are playing rather important parts in the American wire market. Prices are being maintained more firmly.

Still Some Irregularity

Youngstown, O., Aug. 10.—While export demand for barbed wire has been an important factor in sustaining the wire market, domestic business is not so satisfactory. A range of $1.55 to $1.60 per keg, base Pittburgh, represents the valley situation in wire nails. The $1.60 level has not yet been firmly established. Prompt specifications for nails are snapped up in a hurry. Plain wire is firm at $1.40 and galvanized wire at $2.20, Pittsburgh.

Crops Will Help

Buffalo Aug. 10.—The favorable crop report just issued by the government is expected to have a strengthening bearing on the wire market which had been firm and very active for some time. One interest reports that it is sold up over the remainder of the year; and that no deliveries are obtainable under 90 days. Prices are rigid at the recent advances.

Good Showing

Made by Structural Awards in Eastern Territory

New York, Aug. 10.—A good showing is made by structural awards in the metropolitan and New England territory the past week, these totaling about 25,000 tons. It is to be noted, however, that a considerable part of these represented contracts had been in view for some time and their placing had dragged along. It may be that the rising prices for steel products has hastened the closing of these matters. Additions to war plants and other work, arising out of orders for the European belligerents, continue regularly to bring forth a fair-sized tonnage. As a whole, however, the structural situation is not improving in a pronounced way. The tonnage of work coming out is growing, but it is a gradual movement. Complaint by fabricators at the continued low level of prices for such work continues and this branch of the market still offers little satisfaction to the shop trade. On elevated work just awarded in Brooklyn, the price was $40 per ton, delivered, which was $3 higher than the extreme figures quoted there recently. Plain material prices appear very steady at 1.30c, Pittsburgh, or 1.469c, New York, with makers obtaining 1.35c, Pittsburgh, on small current lots. Mill specifications are good.

Philadelphia Subway Work Out

Philadelphia, Aug. 9.—Bids now have been asked for Aug. 16 by the city of Philadelphia for the first section of the subway and elevated extensions which it is estimated eventually will call for about 75,000 to 100,000 tons. This section is in the city hall zone and calls for 5,000 to 10,000 tons of steel. The first portion of the Frankfort elevated line is expected to be advertised next week.

Enlargements of plants for the manufacture of war ammunition and supplies continue to bring forth some good tonnages here. About 2,000 to 3,000 tons additional of this work was placed quietly in the week and details are withheld for the present. The Cramp ship yard, which is planning important enlargements, is getting these plans in final form and early action is awaited. Eastern Pennsylvania shape mills have about all the tonnage they can handle for this quarter and are not desirous of opening their books for fourth quarter. On current business made up of small lots, they are quoting 1.35c, Pittsburgh, or 1.509c, Philadelphia, and have made some sales. The minimum of the market now is firm at 1.30c and makers are foreseeing an early advance of $1 a ton. Deliveries with some mills run eight to ten weeks on an assortment of sizes. The Southern railroad has asked 2,000 tons of channels and angles for car work at Lenoir City, Tenn.

Shapes More Active.

Pittsburgh, Aug. 10.—Structural shapes are more active than they have been in several months. Specifications show more snap and indications are that new buying will increase in volume. This product is held at 1.30c and no deviation from that quotation is found.

Structurals Are Firm

Chicago, Aug. 10.—Structural shapes have gained a position almost as strong as bars and some mills are well filled. The prevailing quotation is 1.49c, Chicago mill, with a tendency to advance $1 per ton, though no maker yet has attempted that figure. Smaller fabricators and users of shapes who were tempted a few

(*For complete prices see page 332.*)

weeks ago to take shrapnel contracts now find a considerable tonnage of small work coming in and have forgotten their warlike ideas in plenty of their accustomed work.

Projects closed in the west recently are for small tonnages, the largest being a bridge over the Calumet river at Hammond, Ind., involving 1,000 tons, which was taken by the Penn Bridge Co.

CONTRACTS AWARDED.

Calumet river bridge, Hammond, Ind., 1,003 tons, to Penn Bridge Co.

Locust street viaduct, Omaha, Neb., 632 tons, to Wisconsin Bridge Co.

Shaft and collar house for Ahmeek Mining Co., Ahmeek, Mich., 398 tons.

Sears-Roebuck printing building, Chicago, 256 tons, to Hansell-Elcock.

Davidson hotel building, Milwaukee, Wis., 265 tons, to South Halsted Street Iron Works.

Great Northern Power Co., transmission line along Spirit Lake Transfer railway, New Duluth, Minn., 190 tons, to American Bridge Co.

Five 70-foot deck plate girder spans, St. Louis & San Francisco railroad, 186 tons, to Virginia Bridge & Iron Co.

Four 75-foot single track deck girder spans in California for Western Pacific Railway Co., 164 tons, to American Bridge Co.

Bridge over Duwamish river for King county, Wash., 146 tons, to Toledo Bridge & Crane Co.

Plant for Streator Clay Mfg. Co., Streator, Ill., 130 tons.

Bridges for the Cuban railroad, 4,000 tons, to Milliken Bros., Inc.

Mill buildings for the Fisk Rubber Co., Chicopee Falls, Mass., 3,000 tons, to the Berlin Construction Co.

Loft building for August Heckscher on Madison avenue, New York City, 3,000 tons, to the Bethlehem Steel Co.

Hoffman House loft building, Twenty-seventh street and Broadway, New York City, 3,500 tons, to the Bethlehem Steel Co.

Larkin printing loft, Thirty-third, Thirty-fourth streets and Eighth avenue, New York City, 8,000 tons, reported to Bethlehem Steel Co. No official confirmation.

Residence for H. Kahn, New York City, 500 tons, to the Bethlehem Steel Co.

Additions to the Gouverneur hospital, New York City, 300 to 400 tons, general contract to the John H. Parker Co.

Truesdale apartment, Washington, 400 tons, to Chesapeake Iron Works.

Substructure for McKean street pier, for City of Philadelphia, 600 tons, the Snare & Triest Co., low bidder on general contract.

Extensions of the plant of the Morrow Mfg. Co., Elmira, N. Y., 400 tons to the American Bridge Co.

Ritz Realty Co. loft, Forty-sixth street, New York City, 400 tons to Terry & Tench.

Hotel, Bridgeport, Conn., 500 tons, to the Phoenix Bridge Co.

Bridges for the Chesapeake & Ohio, 600 tons, to the Virginia Bridge & Iron Works.

Garage for the Cadillac Motor Co., Long Island City, 300 tons, to the Vanderstucken-Ewing Construction Co.

Highway bridge over the Passaic river, N. J., 250 tons, to the Hay Foundry & Iron Works.

Warehouse for the McCahan Sugar Refining Co., Philadelphia, 700 tons, to an independent shop.

Extension of the plant of the Bartlett Hayward Co., Baltimore, 1,500 tons, to the American Bridge Co.

Third tracking of the Myrtle avenue elevated line, Brooklyn, 4,200 tons, to the Phoenix Bridge Co.

Masonic Temple, Utica, 300 tons structural refining general contract, steel let to Smith & Caffrey, Syracuse.

Buffalo Bolt Co., North Tonawanda, N. Y., rolling mill and gas plant, 48 x 112 and 80 x 400, general contract to Morris & Allen, Buffalo, structural steel, 300 tons, to Lackawanna Bridge Co.

Warehouse, Pennsylvania & Lake Erie railroad at Pittsburgh, 7,200 tons, awarded Jones & Laughlin Steel Co.

Extension to New York Ship Building Co.'s plant, 2,500 tons, awarded McClintic-Marshall Co.

Bridges at Philadelphia, 500 tons, awarded McClintic-Marshall Co.

CONTRACTS PENDING.

Pier shed No. 9, Hudson river, New York City, for Central Railroad of New Jersey, 900 tons, bids being taken.

Building at Berkeley, Cal., 2,000 tons, bids taken.

Five bridges for Pennsylvania railroad, 300 to 400 tons, bids being taken.

Store building, Richmond, Va., 400 to 500 tons, bids being taken.

First section of Philadelphia subway extensions covering City Hall zone, covering 7,000 tons, bids to be taken Aug. 16.

Building, Fulton street, Brooklyn, for Oppenheim, Collins & Co., 1,000 tons, bids being taken.

Friers' Club House, Forty-eighth street, New York City, 400 tons, bids being taken.

Apartment for Bing & Bing, New York City, 1,000 tons, bids being taken.

Seven or eight bridges for the New York Central & Hudson River railroad, tonnage indefinite, bids being taken.

Two cruisers for Sweden involving 2,000 tons of armor plate.

Ferro Prices

Are Stiffening—Much Uncertainty as to Shipments

New York, Aug. 10.—With the continued uncertainty over further shipments to this country in the near future of English ferro-manganese, prices on the domestic product and on surplus lots of English metal recently arriving, have stiffened considerably. Recent concessions up to $5 a ton or more from the official price of $100, seaboard, seem to have disappeared. There is an unconfirmed report in the market that a lot of domestic was sold at $130 seaboard, and acting on the basis of this rumor, an eastern Pennsylvania maker in the week has quoted as high as $132, seaboard, for early delivery. Certain English makers are willing to accept further orders at $100, seaboard, for delivery when they are able, leaving the risk of obtaining shipments entirely to the buyer. Some buyers are willing to take their chances under these conditions and several hundred tons were sold in the week on this basis. Ground ferro-manganese is quoted from 6¼ to 7¼ cents per pound at the grinding plant,, depending on quantity.

One agent of English makers reports it has been granted some licenses for August delivery, but that the tonnage represented is much less than the amounts which have been brought in in recent months. Other makers have not yet received authority to ship during the current month, and it is believed that where such privileges have been extended, they represent the supplying of the alloy to specified works, which are manufacturing ammunition and other war supplies for the English government. Arrivals of the past week under July licenses include about 4,000 tons by RAPIDAN at Baltimore. The steamer DOMINION, with several hundred tons, is due at Philadelphia in the next few days.

Prices of 50 per cent ferro-silicon are up about $2 a ton. Small lots now are held at $75, Pittsburgh or Philadelphia, with the usual differential of $1 and $2 less on larger amounts. Domestic spiegeleisen remains at $26, furnace, with a fair demand.

Alloys Strong

Pittsburgh, Aug. 10.—Activity enjoyed by manufacturers of tool steel has tended to strengthen the market for alloys. Some makers of high speed steel are experiencing difficulty in obtaining sufficient quantities of tungsten and vanadium to meet demands. The former alloy is quoted at $2.50 and the latter at a spread from $2.25 to $2.30 a pound of contained alloy. Lower grades of ferro-silicon have been advanced twice the last fortnight, 10 per cent being held at $18 a ton at the furnace by some sellers.

Fifty per cent ferro-silicon is strong at $73 for small lots.

Pipe Progresses Slowly

Pittsburgh, Aug. 10.—No large orders for pipe are reported this week and the market has not reflected as much improvement as many expected. Quotations are described as firm, but they have not been severely tested. Locomotive boiler tubes are fairly active, but merchant tubes show no snap.

Bolt Prices Firm

Cleveland, Aug. 10.—The recent advance in price of nuts and bolts is now established in the Cleveland district and reports from other sections indicate that the new schedule is being maintained. The demand is active and plants are working at full capacity.

Charles A. Converse, of the Baldwin Locomotive Works, Philadelphia, died Aug. 5, in Burlington, Vt. He was born in that city in 1847 and was

(For complete prices see page 332.)

Sheet Advances Hold

And Tonnage on Books is Increasing—Some Irregularity in Blue Annealed Prices

Philadelphia. Aug. 10.—Recent steady advances by eastern sheet makers are being maintained and still the tonnage on their books is increasing. Though operating full, each week adds some orders to the unfilled list. Prices for the current quarter run from 1.45c to 1.50c, Pittsburgh, for No. 10 gage, blue annealed, or 1.609c to 1.659c, Philadelphia. Makers do not care for last quarter business at present, though inquiry is appearing.

Cutting on Blue Annealed

Cleveland Aug. 10.—Quotations on black sheets are firmer but there is still some irregularity on blue annealed. A rather peculiar development of the last week was the shading of blue annealed sheets made from bessemer sheet bars $2 to $3 below the price of those made from open hearth sheet bars. This method of quoting however does not seem to be general.

Sheets Are Stronger

Chicago, Aug. 10.—Local makers of galvanized sheets continue to remain out of the market, the leading independent having been in that position almost six months. Only one galvanizing pot at this plant is kept hot and the trailing ends of old contracts are being finished.

Ohio mills are quoting 4c, Pittsburgh, on No. 28 gage, and this principally to old customers in need. Resumption of regular conditions in galvanized sheets awaits return of spelter to 8 or 9 cents when sheets can be made at a price which buyers can afford to pay for ordinary uses.

Black sheets have been advanced to 2.04c, Chicago mill, by the independent mill in Chicago. Blue annealed also are higher.

Sheets Weaker

Cincinnati, Aug. 10.—Galvanized sheets are a little weaker, due to lack of demand for prompt shipment, and the refusal of mills to quote very far ahead. They are quoted at from 4c to 5c, Pittsburgh basis with the lower figure prevailing. Black sheets are stronger and are firm at from 1.80c to 1.85c, Pittsburgh basis.

Prices Stiffening

Pittsburgh, Aug. 10.—Steel sheet products, like other lines of finished material, are active and prices of all grades, except galvanized, gradually are stiffening. Black sheets are being held at 1.90c, base, by some mills and blue annealed products are selling as high as 1.50c in numerous instances. Galvanized sheets are obtainable at 4c, base, and lower figures probably will come out if spelter continues to decline. Because of the rather acute scarcity of open hearth steel sheet bars, most manufacturers are able to obtain maximum quotations for finished open hearth material. Bessemer products are selling at minimum prices in most instances. Mills are operating at from about 75 to 85 per cent of theoretical capacity.

Some Interesting Features

Some Interesting Features

Youngstown, O., Aug. 10.—Steel sheet manufacturers have not yet extricated themselves from the predicament into which they were plunged by the skyrocketing of spelter prices. At 4c to 4.50c galvanized sheets are quoted at almost prohibitive figure, especially as regards the southern market, which ordinarily is an extremely important consumer of galvanized roofing. It is estimated that current business in galvanized sheets is not more than 50 per cent of normal.

Much sheet mill capacity continues to be devoted to the manufacture of black sheets. One company organized to manufacture galvanized and black sheets, completing its mill just before the furor in spelter, is said to have done practically no business as yet in galvanized. Other valley mills have had much the same experience. Those concerns which were forced to pay as high as $10 a ton to cancel contracts when spelter was so high had to roll something to keep going. The large supply of black sheets that has been coming on the market necessarily has militated against prices, although demand has shown considerable improvement in the past month or so.

But another factor, increasing costs, now must be considered. Most sheet makers are covered on sheet bars for the third quarter, rolling sheets at present from bars bought at much lower price than those now prevailing for prompt material. Black sheets No. 28 are quoted 1.85c or $37 a net ton. Open hearth sheet bars are held at $24 a gross ton, Youngstown mill. Hot mill costs, according to the Amalgamated wage scale, are $11.41 a ton. When added to this are power, overhead, freight rates on material, loading, lumber, increasing labor costs, selling costs, etc., it is evident the sheet mill which buys its bars would stand to lose several dollars a ton if it bought sheet bars at current quotations and sold sheets at the present market prices. These conditions indicate a considerable advance in black sheets for the last quarter. The same thing holds true in respect to blue annealed sheets.

Export business is improving. Certain valley mills have booked orders for Greece, South America and Canada. Domestic business in black sheets is showing definite betterment.

(For complete prices see page 332.)

Tin Plate Order

Philadelphia, Aug. 10.—The Atlantic Refining Co. has placed 1,000 boxes of tin plate for shipment this year with an independent maker in West Virginia. There is not much new buying of tin plate in this district at present.

Tin Plate Quiet

Pittsburgh, Aug. 10.—Specifications for tin plate are coming out in fairly good volume, but no new business of importance is reported. Prospects of heavy crops throughout most parts of the country are decidedly bright and indications are that canning interests will make large reservations. Tin plate is still selling at 3.10c. Additional orders for far eastern shipment have been booked.

Ore Movement

Direct to Furnaces Much Heavier Than Last Year

Cleveland, Aug. 10.—The ore on Lake Erie docks Aug. 1 was almost the same as on the same day last year, the tonnage being 6,539,933 on Aug. 1 last year, and 6,629,653 on Aug. 1, 1914. The ore movement from mines for the season ending Aug. 1 was greater by 3,316,673 tons this year than in the same period last year, and the dock statistics show that the direct movement of ore to furnaces is much heavier than it was last year. Receipts at Lake Erie ports for July were as follows:

Port.	Gross tons.
Buffalo	803,789
Port Colborne	8,252
Erie	85,667
Conneaut	1,434,386
Ashtabula	1,371,531
Fairport	369,298
Cleveland	1,241,132
Lorain	603,880
Huron	110,013
Sandusky	.....
Toledo	106,602
Detroit	27,180
Total	6,161,730

Meyer Green, of the Canton Iron & Metal Co., Canton, O., died unexpectedly at Cleveland last Saturday.

Scrap Prices Advancing

Higher Quotations in Leading Centers and Buyers Are More Active

Philadelphia, Aug. 9.—Under a demand which extends to practically all grades, the old material market in this district continues to advance in price and to acquire strength. Heavy melting steel now is up to $13.55, delivered eastern Pennsylvania, and sellers report this figure readily obtainable. One works paid this price for about 5,000 tons or so. Some works are buying at the market all the steel they can get for various deliveries this year. Others with good stocks are content only to pick up bargains which are becoming fewer. Wrought grades continue to rise. For No. 1 railroad, $14.50 to $15, delivered, now is quoted. This grade is rather in light supply. Three buyers are offering $12, delivered, for wrought pipe. Italy has offered about $17, eastern Pennsylvania basis, for 500 tons of steel axles. The Pennsylvania railroad's list for July, just closed, brought fully $1 advance over June.

Scrap Out of Rut

Pittsburgh, Aug. 10.—Iron and steel scrap after dragging many months, is beginning to show strength and dealers express confidence that higher quotations will feature the situation the next few weeks. It is understood that as high as $14 has been paid for a carefully selected tonnoge of heavy melting steel, but the general market has not reached that figure. More prominent consumers are beginning to figure in the market again for future needs, but contracting has not been heavy.

Gaining Strength

Chicago, Aug. 10.—Consistent advances are being registered in the scrap market, items which did not forge ahead on the recent selling coming into their own as developments have proceeded. Heavy melting steel, which reached almost to $12 recently, but has sagged back a trifle, remains at its former level while rolling mill grades have strengthened materially. Demand is increasing and dealers with accumulations are not anxious to sell, believing the present movement will attain much higher levels.

Railroads are offering large tonnages which are being absorbed without difficulty. The Northern Pacific has a list out containing 1,900 tons; the C., St. P., H. & O. offers 750 tons; the Milwaukee road 2,100 tons; the Kansas City Southern 400 tons; the Michigan Central 660 tons; the Soo line 660 tons, and the Southern railway, 2,500 tons.

Buffalo Market Active

Buffalo, Aug. 10.—Large tonnages of heavy melting steel are being sold by Buffalo dealers to mills in the Pittsburgh district, and for the first time in a long while at a price sufficient to absorb the freight differential. This line is now firmly held at $11.50 to $12. Demand for heavy melting steel and a number of other lines in Buffalo and the territory served from here has caused advances in the price schedules on No. 1 railroad wrought, iron axles and particularly steel axles, low phosphorus steel scrap, bundled sheet, No. 2 busheling scrap, wrought pipe, and clean cast borings.

The least active items on the list include old car wheels and railroad malleable. Dealers look for a greater volume of activity and consequent additional advances in prices in practically all lines.

Brokers Active

New York, Aug. 10.—Brokers still are making the market for old material in this district and are offering some rather extravagant prices. They have been bidding so hard for material that the yards are holding back on sales so that not a great deal of tonnage here has moved to the works. Upwards of $12.25, New York, has been paid for heavy melting steel. The consuming market on steel is $13.50, delivered, and two works, one in New Jersey and another in eastern Pennsylvania, are freely offering this price. For wrought pipe, users offer up to $12.50, delivered, or 10.50, New York. Heavy cast is about $12, Jersey points. An additional sale of 11,500 tons of crop ends and old steel rails to Italy by an eastern steel works brings the total of such recent transactions by this company up to about 30,000 tons. The last sale was made at $15.75, tidewater, or a round advance over the transactions preceding.

Scrap Steel Stronger

Cincinnati, Aug. 10.—Slight advances have occurred in the iron and steel scrap market, especially on grades used in the making of steel. Heavy melting scrap is quoted 50 cents per gross ton above prices of two weeks ago, and is now given at from $9.25 to $9.75. No. 1 yard wrought, No. 1 busheling, and bundled sheet scrap have also advanced from 25 to 50 cents per net ton each. A better feeling has developed in the market because of the activity in pig iron and heavy sales to rolling mills in this territory. Stove making scrap is dull and weak.

Speculative Fever

Cleveland, Aug. 10.—The speculative fever has seized a large part of the iron and steel scrap trade and buying for a rise has helped to push prices up. The mill consumers in this district and in the valleys seem to have conducted a quiet buying campaign for the past few weeks, with the result that most of them are well supplied, and only willing to accept "bargains". Supplies of scrap over the country are plentiful. Shipments to mills have been so fast and furious that several consumers are rejecting shipments, and one, the United Steel Co., Canton, is embargoed. Heavy melting steel quotations are 25 cents a ton higher at $11.50 to $11.75, Cleveland, and $12.25 to $12.50, Youngstown.

Prices Advancing

St. Louis, Aug. 10.—The local market is strong and prices are advancing every day. Leading consumers appear to be interested in the market, and there is still a shortage of heavy melting steel and re-rolling rails. Prices are apt to advance still higher. Today, quotations are about 50 cents higher on nearly all items than a week ago.

Railroad offerings this week are: Vandalia, 1,000 tons; Mobile & Ohio, 600 tons; Kansas City Southern, 400 tons; Union Pacific, 1,950 tons, very little of which will come into this market, however.

(For complete prices see page 332.)

Shot at Directors' Meeting

W. C. Brohm, vice president and general manager of Grainger & Co., of Louisville, who operates a large machine shop and structural iron plant, was shot and seriously injured Aug. 4, by F. M. Cockrell Jr., president of the Cockrell Mfg. Co. Mr. Brohm is secretary and treasurer of the latter concern, which makes a patent cane harvesting machine. The machine has been made in the plant of Grainger & Co. The shooting occurred at a directors' meeting of the Cockerell Mfg. Co., and grew out of accusations by Mr. Cockrell regarding Mr. Brohm's work in his double capacity. It is believed Mr. Brohm will recover. He was shot in the right breast.

Billet Famine

Results in Fancy Prices in Eastern Territory.

Philadelphia, Aug. 10.—Billet prices in eastern territory continue to be determined by the answer the buyers are making to the question how badly they need the steel and how much they can bid for it. A genuine famine in rerolling billets, especially open hearth, is shown in this market and the eastern works which usually sell large quantities now have only limited tonnages, if any, to offer for the year. In one instance, a buyer this week verbally accepted a quotation of $36, eastern Pennsylvania mill, on a good-sized tonnage of open hearth billets, which, while they contained some nickel and chromium, were nothing more than the run of the mill. Another maker sold small lots of open hearth at $30, mill, and ordinary forging billets at $35, mill. To regular customers, eastern makers have quoted $32, mill on limited lots of rerolling open hearth steel for the year. The inquiry before eastern makers is good, both from domestic and foreign buyers. Fresh lots from the latter running 1,000 to 4,000 tons excite no interest and are not being quoted on. Italy has purchased 7,500 tons additional of rail crop ends from an eastern steel works, paying $15.75, tidewater. This is an advance of $3.75 over a previous sale to that country by the same maker, some weeks ago. A Richmond buyer asks 500 to 1,000 tons of small billets.

Italy Inquires

New York, Aug. 10.—Some sizeable inquiries for billets are pending in this market. A domestic buyer is asking for 25,000 tons of special quality and Italy is inquiring for 15,000 tons of billets. Available material is scarce and prices are very strong, the eastern Pennsylvania makers quoting from $32, mill, upward on re-rolling billets.

Strong at Pittsburgh

Pittsburgh, Aug. 10.—Market observers in western Pennsylvania and eastern Ohio do not seem to know what position billets and sheet bars occupy. It is generally conceded that all lines of semi-finished products are decidedly strong and continued price advances are expected. Most consumers covered requirements earlier in the year. Wire rods are being held at $27 a ton.

Generating Plants.—The United States navy department has awarded to the International Oxygen Co., New York, the contract for the erection of a hydrogen generating plant for ballooning purposes at the aeronautic station of the navy yard at Pensacola, Fla. The International Oxygen Co. has also received the award from the government for the installation of an I. O. C. system for generating oxygen and hydrogen at the Washington navy yard, Washington, D. C.

Warehouse Prices

Are Marked Up—Business Continues to Improve

Cleveland Aug. 10.—For a number of months warehouse business in the Cleveland district has been steadily improving. During the last few days of July business was unusually active and has so continued this month. Prices on bars shapes and plates have been advanced $2 per ton and quotations are now 1.90c on bars and 2c on shapes and plates. No changes in quotations have been made on bar iron or sheets.

Higher Price From Store

Chicago, Aug. 10.—Steel products from store have been advanced, $1 per ton being added to most items in the past few days. This is the first advance on warehouse goods in several months and follows activity of mills and consequent higher prices for direct steel. Bars are quoted at 1.70c, Chicago store, with plates and shapes at 1.80c.

Warehouses at St. Louis and St. Paul also have advanced, bars being quoted now at St. Louis at 1.75c and at St. Paul at 1.80c.

Demand for goods from store has increased as mills find delivery more difficult to make with promptness. Greater building operations locally with industrial peace assured also has given an impetus to demand for articles entering into construction work.

Cast Iron Pipe

Private Buying Active, But Public Awards Are Few

New York, Aug. 10.—In the case of some eastern makers, July bookings of cast iron pipe did not equal June; in others they were slightly in excess. Public lettings, with a few exceptions, do not run to large amounts, but private buying is good. Generally speaking, the situation is holding its own and prices still make some progress towards higher levels. Watervliet, N. Y., asks bids for Aug. 16, on 3,000 tons of 4 to 30's. If wooden pipe is not used for a portion of the line, about 3,000 tons more of 20's will be required. Wellsville, N. Y., is inquiring for 500 tons of 4 to 14's for Aug. 25; Centerville, N. Y., for 420 tons of 4 to 8's for Aug. 17, and Boston for 310 tons of 48 and 84's for Aug. 18. The Warren Foundry & Machine Co. took a small tonnage for South Orange, N. J., at $25.50, delivered, for the 4's, and at $23 for the 6 and 10's, and 306 tons of 6 to 14's for Mansfield, Mass., at $24.30. The Standard Cast Iron Pipe & Foundry Co. received 260 tons of 6 to 20's for Perth Amboy, N. J., at $21.84, and the United States Cast Iron Pipe & Foundry Co., 170 tons of 10's for Philadelphia at $23.30. Vroon & Arnold were awarded 205 tons of 6 to 24's at $33 for St. Johns, N. B.

Cast Pipe Market Slow

Chicago, Aug. 10.—Buying of cast iron pipe is slow, cities having covered early. Specifications are being made for large tonnages and foundries are busy. Little business is in prospect at present. An advance in prices seems likely in the near future, but it has not been announced thus far.

The United States Cast Iron Pipe & Foundry Co. has been awarded 500 tons of high pressure pipe at Cincinnati and probably will be given 1,200 tons of 42-inch intake pipe at Kenosha, Wis., the contract for which was let to a contractor in that state. Bids have been opened but awards not yet made on 260 tons at Watertown, S. D., 180 tons at Riverside, Ia., and 1,500 tons at Cambridge, O.

Another Koppers Contract

H. Koppers Co., First National Bank building, Pittsburgh, has taken a contract for designing and erecting 204 by-product coke ovens for Corrigan, McKinney & Co., Cleveland. The by-product plant will have a capacity of from 2,200 to 2,300 tons of coke, sufficient to meet the requirements of the blast furnace plant, which ultimately will consist of four stacks, two of which are under construction. Since Jan. 1, the Koppers company has received contracts for approximately 1,000 by-product coke ovens, which, when completed, will increase the by-product coke capacity of the country from between 25 to 30 per cent.

Will Extend Plant

At a meeting of the stockholders of the Trumbull Steel Co., Warren, O., held Aug. 6, the capital stock was increased from $2,500,000 to $4,000,000. This increase will be used for further extensions, but no definite plans have been made up to the present time.

D. W. Kerr, who has been secretary and treasurer of this company since its organization, has been elevated to the position of vice president.

(For complete prices see page 332.)

Russian Orders

Will Include Large Tonnage of Rails—Some Domestic Business

New York, Aug. 10.—Russia now is making final arrangements for the purchase of large additional tonnages of rails in this country, through Count S. I. Shulenberg, of the Imperial Railroad Commission, who recently arrived in this country. Details have been practically settled regarding the 100,000-ton lot recently credited to the Cambria Steel Co., and a large part of this will be rolled at the Sparrows Point mill. Another maker is working on about 100,000 tons additional and an eastern Pennsylvania mill has been offered 20,000 tons more. France is inquiring for 15,000 tons of 60-pound and 15,000 tons of 80-pound rails.

The Philadelphia & Reading railroad has placed about 10,000 tons of rails, of which 8,000 went to the Pennsylvania Steel Co. and about 1,000 tons to the Bethlehem Steel Co. This road recently placed quietly a good tonnage with the Bethlehem mill. The Southern railway has ordered 4,000 tons additional of the Maryland Steel Co. The Manganese Steel Rail Co. has taken 3,000 tons of manganese rails for New York subway and elevated railway extensions.

The car market shows no large amount of activity. Inquiries still are chiefly for the repair of equipment rather than for the purchase of new. The Baltimore & Ohio railroad has placed 1,200 car bodies with two or three builders. The Erie railroad has placed 50 locomotives with the American Locomotive Co., the largest order in some time, the Atlantic Coast Line 10 with the Baldwin Locomotive Works and the Richmond, Fredericksburg & Potomac two with the same works.

Spelter Weak

And Market Approaches Demoralized Condition

New York, Aug. 10.—The week closing today reflected conditions approaching demoralization in the lead, spelter and copper markets, and a weakening tendency in all the other metals excepting aluminum and nickel. Nickel has been advanced and is quoted at 45c for shot and ingots and at 50c for electrolytic nickel. In aluminum, due to the extent to which the domestic producer is sold ahead, and to the embargoes on foreign exports, second sellers continue able to get high prices. Sales of car-loads have been made at from 33c to 35c and one lot of five carloads sold at 37.50c.

One of the features of the week was the sagging off of the markets in London, due to unfavorable war developments, chief of which was the fall of Warsaw. Thus, spelter today closed at £67, compared with £91 10s last Tuesday. The weakness in London, combined with the total lack of demand here, caused prices to crumble from ½c to 1c almost each day. At present, producers are willing to sell prime western at 14c to 14.50c for prompt shipment, 13.50c to 14c for September and 13c to 13.50c for the last quarter, and the trade would not be surprised to witness a further decline within the next few days. Brass special is quoted nominally at 16.50c to 17c for prompt, 16.25c to 16.75c for September and 16c to 16.50c for the last quarter.

Unfilled Orders

Of Steel Corporation in July—Shipments Very Heavy

An increase of 250,344 tons in the unfilled order book of the United States Steel Corporation fully reached the general expectations and, if anything, slightly exceeded them. This gain over against shipments in July which approximated the full rated capacity of the leading producer or about 46,000 tons daily, brought the booked orders July 31 to 4,928,540 tons, the largest since February, 1914. On the computation that the Corporation's shipments in July were around 40,000 to 45,000 daily, the new business taken averaged 50,000 to 55,000 tons daily.

McKinley Memorial

Contract is Awarded—Will be Built of Georgia Marble

The contract for the building of the memorial to be erected at the birthplace of the late President William McKinley at Niles, O., has been awarded to the John H. Parker Co., of New York, which was recently awarded the contract for the building for the department of the interior at Washington. The award of the memorial was made by the building committee of the National McKinley Birthplace Memorial Association of which J. G. Butler Jr., vice president of the Brier Hill Steel Co., is president. This committee includes: W. A. Thomas, president of the Brier Hill Steel Co.; C. S. Thomas, A. J. Bentley, J. N. Baldwin and W. H. Stevens. The building will be of gray Georgia marble of the very handsome design described in *The Iron Trade Review* of Feb. 11, 1915. The dedication will take place in the fall of 1916. Former President William H. Taft has promised to be present and President Woodrow Wilson and former President Theodore Roosevelt will be invited.

Big Slump

In Output of Iron and Steel Products Last Year

Statistical bulletins just issued by the statistical bureau of the American Iron and Steel Institute show very clearly the big slump in production of iron and steel products in 1914 as compared with the preceding years. The most important statistics are reproduced elsewhere in this issue. The production of steel ingots and castings amounts to only 23,513,030 tons in 1914 compared with 31,300,874 tons in 1913. The exception to the rule of decline in production is furnished by tin plates and terne plates of which 2,085,980,000 pounds were produced in 1914 compared with 1,845,130,000 pounds in 1913.

The production of the principal iron and steel products in Canada in 1914 was as follows: Steel ingots and castings, 694,447 tons; finished rolled products, 659,519 tons.

Of the finished rolled products in Canada, the principal tonnage was in rails, it being 382,344, while 218,125 tons include plates, sheets and bars. The production of structural shapes and wire rods was 59,050. The production of all kinds of pig iron in Canada for the first half of 1915 amounted to 366,825 tons.

B. & O. Buys

Places Order for Rails—Basic Sold at Advance

New York, Aug. 11. (By wire.)—The Baltimore & Ohio has bought 17,000 tons of rails from eastern mills. The Chicago & Pittsburgh and Chesapeake & Ohio has ordered 6,000 tons.

The American Bridge Co. has taken 11,000 tons of shapes for a Brooklyn elevated section from Rogers & Hagerty, contractors. The Chicago & Great Western asks for 3,500 tons for Chicago track elevation.

A sale of basic has been made by E. & G. Brooks, Birdsboro, Pa., for delivery September to January, at $15.25, delivered.

Only One Idle

Chicago, Aug. 10.—The tenth blast furnace stack has been blown in at the plant of the Illinois Steel Co. at South Chicago, leaving only one stack cold of the 11 at that plant.

MEN OF THE IRON TRADE

Who they are **Where they are** **What they are doing**

James C. Potter, president of the Potter & Johnson Co., Pawtucket, R. I., has returned from a European trip.

F. S. Blackall, general manager of the Taft-Pierce Mfg. Co., Woonsocket, R. I., returned last week from a trip to Europe.

W. G. Fisher, president of the International High Speed Steel Co., of 99 Nassau street, New York, is seriously ill.

Clarence A. Earl, vice president and general manager of the Hendee Mfg. Co., Springfield, Mass., has resigned to become vice president and a director of the Willys-Overland Co., Toledo, O., effective in October.

Hon. George M. Wright, president of the Wright Wire Co., Worcester and Palmer, Mass., and mayor of Worcester, has been elected president of the Park Trust Co., a new banking institution of that city.

Frank W. Tickner has been promoted to be general manager of the Valley Mould & Iron Co., Sharpsville, Pa. Edward H. Body takes his place as general superintendent of the company.

Simon S. Martin, formerly general superintendent of the Maryland Steel Co., Sparrows Point, Md., has been elected vice president and director of the Algoma Steel Corporation, Sault Ste. Marie, Ont.

Harry F. Gordon, formerly advertising manager of the Whitaker-Glessner Co., Wheeling, W. Va., has accepted a similar position with the Newport Rolling Mill Co., and the Andrews Steel Co., allied interests of Newport, Ky.

Lewis Littlepage Holladay and Henry Negstad have become associated in the firm of Holladay, Negstad & Co., 109 North Dearborn street, Chicago, for the practice of consulting engineering in the field of power plants, utilities and industries.

Augustus Wood has been appointed general manager of the Niles Tool Works Co., Hamilton, O. Mr. Wood has been acting as general manager since the death of George T. Reiss, and has been chief draftsman of the company for 10 years.

Henry A. Getty, for many years employed in the flat wire sales department of the American Steel & Wire Co., in Worcester, Mass., has resigned to become New England representative of the Columbia Steel & Shafting Co., Pittsburgh, with offices in Boston.

F. D. Larkin, assistant professor of mechanical engineering, Lehigh University, has been granted a year's leave of absence and will become connected with the Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa., which is engaged in the manufacture of war munitions.

Willard E. Freeland, assistant advertising manager of the Norton Co., Worcester, Mass., has tendered his resignation, having accepted the position of New England representative of *The Iron Age*, New York, succeeding John Nelson, who has held it many years.

Dr. John Brashear, Pittsburgh, recently selected as Pennsylvania's foremost citizen, has been appointed by Secretary of the Navy Josephus Daniels to aid in naming a board of inventors for the United States navy. Dr. Brashear is president of the American Society of Mechanical Engineers.

W. P. Cochran, formerly branch manager of the Westinghouse Electric & Mfg. Co. at Baltimore, has been appointed assistant district manager of the Philadelphia district, including Baltimore, and will make his headquarters in the former city. M. H. Jones, assistant to manager, will have charge of the Baltimore branch office.

Horace W. Willson, for 56 years in the employ of the American Steel & Wire Co., in Worcester, Mass., and for the last quarter century a salesman in charge of piano wire products, has been retired on a pension. He is one of the best known wire salesmen in the United States. Mr. Willson, who will be 76 years old Aug. 15, intends to make New York his future home.

W. S. Burgess has disposed of his interest in the Stoddard-Burgess Co., 426 South Clinton street, Chicago, to E. B. Stoddard, who will continue the business. Mr. Burgess would like to hear from any manufacturer wishing a representative in the central west. He has spent eight years as salesman with the Imperial Brass Mfg. Co. and is well acquainted with brass foundry and machine shop practice.

J. A. Massel, special agent of the department of commerce of the United States, who recently returned from an extended trip to South America, where he studied machine tool markets, was in Boston last week, and and this week is in Cleveland. His purpose in visiting these and other cieits, as stated in *The Iron Trade Review* last week, is to discuss with machine tool manufacturers matters of particular interest to the trade.

H. E. Barrett, who recently resigned the position of business manager of the Louisville, Ky., Y. M. C. A. to return to his former position at the Henry Vogt Machine Co., Louisville, reassumed supervision on Aug. 1 of ice machinery sales. Guy Ellis, formerly in charge of this department, has been placed at the head of the new department of foundry fittings and forgings works and general jobbing.

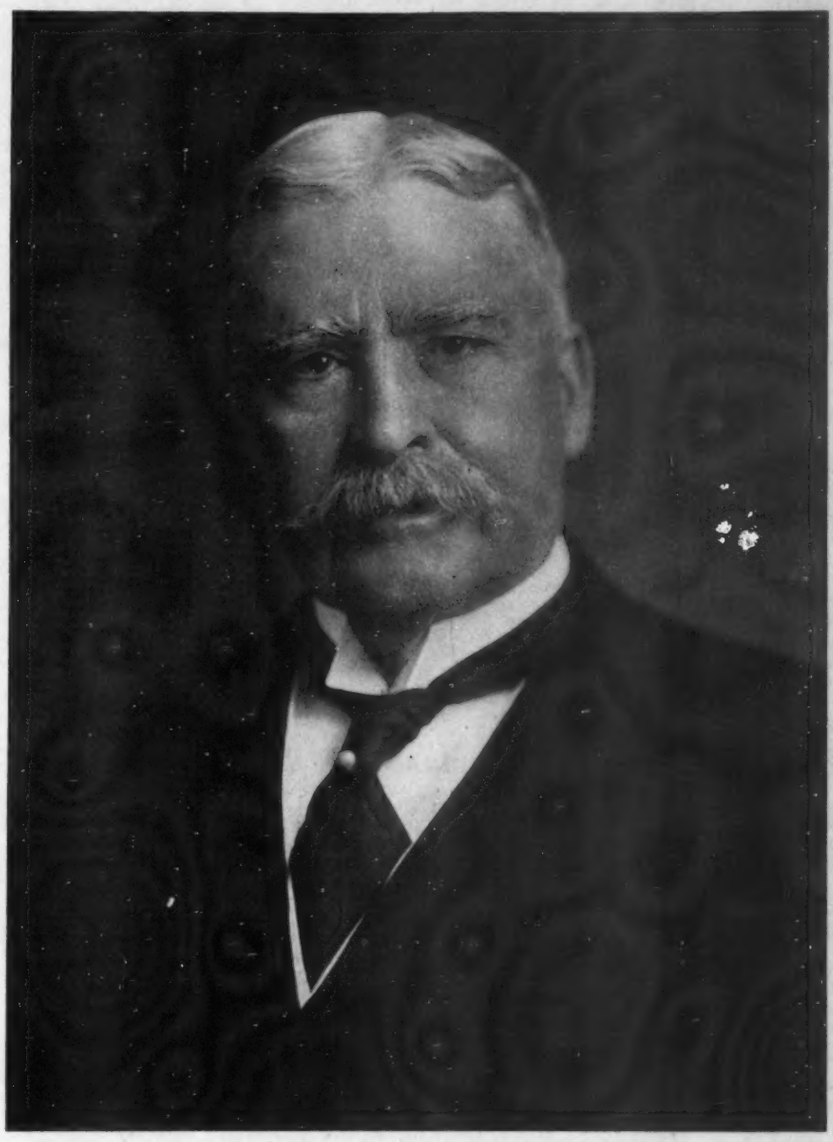
Charles B. Ellis, who has been connected with the American Vanadium Co. as an assistant to J. L. Replogle, vice president and general manager of sales at New York has become associated with the Bartlett-Hayward Co., Baltimore. Previously to his employment by the American Vanadium Co., Mr. Ellis was with the Cambria Steel Co. for many years both at Johnstown and at Philadelphia.

Charles E. Glover, vice president of the American Hardware Corporation and general manager of its Corbin screw division in New Britain, Conn., has been elected president of the Skinner Chuck Co., of that city, to succeed David N. Camp, New Britain's grand old man. D. O. Rogers, who has been vice president and manager, is succeeded by E. J. Skinner, secretary of the company. Paul K. Rogers takes Mr. Skinner's place as secretary.

Arthur C. Rogers, who has long been engaged as an advertising agent in Cleveland, announces that Allen Brett and Robert T. Gage have become associated with him in magazine, newspaper, trade paper and other advertising. Both Mr. Gage and Mr. Brett are college graduates. Mr. Gage has had experience as a lawyer and as an advertising manager, while Mr. Brett has been editor of *Concrete Engineering*, and the *Cement Age*, and has done editorial and advertising work on other papers. The office of the firm is at 722 Citizens building.

George G. McMurtry, Founder of Vandergrift, Dies at Atlantic City

GEORGE G. McMURTRY, chairman of the American Sheet & Tin Plate Co., founder of the model mill town of Vandergrift, Pa., and one of the most prominent of the older school of sheet and tin plate manufacturers of the country, died at Atlantic City, N. J., Aug. 5. Mr. McMurtry had gone to the seaside resort several weeks ago, suffering from a severe cold and from bronchitis, which had left him in a depleted condition. Reassuring reports of his condition had been received only several days ago, so that the end came unexpectedly and was due to an unexpected heart attack. Mr. McMurtry entered the iron and steel business in his early days at Apollo, Pa. Subsequently, he became connected with the Apollo Iron & Steel Co., manufacturer of steel sheets, and by virtue of his ability as an executive and manufacturer, rose to the presidency of the company. He had always been known as a firm friend of the workmen and gave his constant attention to providing for the welfare and comfort of his employes. As the business of the Apollo company grew, he conceived the idea of building a new industrial town in accordance with the most modern and scientific ideas. The result was that in 1895, a tract of 640 acres of farm land was acquired nearby Apollo and the town of Vandergrift was founded. Before carrying out this plan, Mr. McMurtry had made a careful study of the principal steel works communities in Europe and he combined in the new town the best institutions and ideas of these units. The care and thoroughness exercised in this enterprise caused Vandergrift to be known as the model mill town and it has served a great purpose in helping to shape the extensive welfare and community development plans of the Steel Corporation in later years.



GEORGE G. McMURTRY
Photo by Campbell's Studio, New York.

The Apollo Iron & Steel Co. was absorbed by the organization of the American Sheet Steel Co. in 1900 and Mr. McMurtry became the first president of the combination, with offices in New York. The formation of the American Sheet & Tin Plate Co. followed in 1904 and Mr. McMurtry remained in New York as chairman of the board of directors, a position which he has occupied ever since. His office has been at the Steel Corporation headquarters, at 71 Broadway. He also was a director of the American Can Co., of the Rock Island railroad and of other corporations. Mr. McMurtry was a native of Belfast, Ireland, and came to this country in early life. He was known among his associates as a man of lovable disposition, but inclined towards extreme modesty and self-effacement, so that his name rarely appeared before the public in any way. He resided at 712 Fifth avenue. He is survived by a widow and three sons.

Allan Strale, aged 58, consulting engineer for the Inland Steel Co., Chicago, was found dead in his bed the morning of Aug. 6, at his home in Chicago. He was a graduate of the University of Stockholm. He assisted in laying out the city of Gary. Heart disease caused his death.

George L. Damon, a well-known manufacturer of steel safes, died at Hull, Mass., recently, aged 74 years. He was connected for many years with the American Steel Safe Co.

Money and Iron: Fact and Comment

Excitement About War Stocks—Bethlehem Does More Climbing—Other Stocks Register Important Gains

WHILE warnings are still being given in regard to the dangers which may arise from the excited condition of the stock market, there are some who are pointing out that conditions in past years have had a more dangerous look without causing serious trouble. It might also be shown that at times when the market was not excited as it is nowadays there was real danger ahead and panics came. So it would seem wise for investors to be exceedingly cautious at the present time. U. S. Cousins, editor of the *American Banker*, says:

There are certain times and certain occasions when a "boom" in the stock market is anything but desirable; when the extraordinarily large dealings in securities represent an unhealthy instead of a healthy condition of affairs. Under normal conditions a "million-share day" on the New York stock exchange would be heralded as one of the sure omens of financial and industrial prosperity and success.

Present times and conditions are unfortunately not normal. Speculation in war stocks at such a feverish pace that transactions in a single day exceed one and one-half million shares, and the prices of industrial shares fluctuate 20 points in as many minutes, does not add to the prestige of the stock exchange. The activity of the market in recent weeks has been confined almost exclusively to these "war stocks", the prize in view being the enormous profits which these temporary arsenals are supposed to produce.

It is the old story of the "professionals" stimulating and manipulating the market, while the "outside public", allured by the prospect of winning a fortune over night, risks its money on a stock the real value of which it is blissfully ignorant. Numerous warnings have already been sounded, both by conscientious brokers and in the public press, but as yet there seems no way of putting the brake on this reckless speculation.

During the past week, the war stocks gave some further exhibitions of what they can do and some of the stocks like United States Steel, which are not usually classed with Bethlehem, Crucible and other war stocks, made very substantial advances. Bethlehem made a new record at 311 Friday, but declined and closed with the loss of a half point for the day. But it could well afford to do that, as the gain, compared with the preceding week, had been large enough and at the close Saturday was 45 points ahead of the close on July 31.

Throughout the week there was the usual exaggeration in regard to war orders. There was also news of an improvement of a substantial character, especially in the pig iron market, in which prices were steady and the efforts of buyers to cover for first year requirements were more determined.

Quotations at the close of business on July 31 and changes in the leading stocks identified with the iron and steel industry are shown in the following table:

	Close Aug. 7.	Net chg.
Amer. Brake Shoe & Fdy. Co., ctfs.	106	+5¾
Amer. Brake Shoe & Fdy. Co., ctfs., prfd.	174⅞	+14⅞
American Can	59	+2⅜
American Can, prfd.	106⅛	+ ⅛
Amer. Car & Fdy. Co.	61½	+4½
Amer. Car & Fdy. Co., prfd.	118	+4
American Locomotive	52¾	—1
American Locomotive, prfd.	98	+2
American Steel Foundries	42½	— ½
Baldwin Locomotive	78½	+ ⅜
Baldwin Locomotive, prfd.	106	+1½
Bethlehem Steel	290	+45
Bethlehem Steel, prfd.	135	+5
Colorado Fuel & Iron	41	+2
Continental Can	88¾	+14½
Continental Can, prfd.	103	+2
Crucible Steel	85½	+17¼
Crucible Steel, prfd.	104½	+1½
General Electric	171	— ½
International Harv. of N. J.	109	+11
International Harv. Corp.	70	+10
Nat'l Enamel'g & Stmp. Co.	24	— ½
Pressed Steel Car	57⅞	+7¼
Pressed Steel Car, prfd.	100⅛	+ ⅛
Pullman Palace Car	160	+1
Republic Iron & Steel	44⅛	+1½
Republic Iron & Steel, prfd.	98	+2¼
U. S. Cast Iron Pipe & Fdy.	18	+2
U. S. C. I. Pipe & Fdy., prfd.	40	+4
United States Steel	72⅜	+4¾
United States Steel, prfd.	112⅝	+1⅜
Westinghouse Mfg.	112⅜	+1⅞

Pennsylvania Steel Plans

Directors of the Pennsylvania Steel Co. will hold their next semi-annual meeting in October, when many stockholders look for favorable dividend action. The last preferred dividend was 2½ per cent, paid Nov. 1, 1913. Thus three semi-annual dividends have been passed which would amount to 10½ per cent based on semi-annual payments of 3½ per cent each. The company paid dividends of 7 per cent annual from 1903 to 1911, inclusive, and paid 5 per cent in 1912. In April, 1913, directors reduced the dividend to 2½ per cent and have paid nothing since.

Deficit Increased

The report of the American Steel Foundries, Chicago, for the quarter ending June 30 was disappointing to bulls on the stock market. The deficit for the six months after paying interest on bonds is $357,000, an increase of $169,000. Friends of the company say it has not begun to realize as yet from recent good orders. The report compares with the corresponding quarter the previous year as follows:

	1915.	1914.
†Net earnings	$103,195	$243,210
Other income	16,877	24,534
Total inc.	$120,072	$267,744
Chgs. and depr.	220,742	292,447
Deficit	$100,670	$24,704
Six months ended June 30:		
†Net earn.	$43,967	$242,162
Other income	30,155	42,683
Total inc.	$74,122	$284,845
Chgs. & depr. sink. fd. etc.	‡431,126	472,902
Deficit	$357,003	$188,057

†After deducting manufacturing, selling, administrative, and other expenses.

‡Includes charge for retirement of 4 per cent debentures, $127,500; sinking fund requirements, $115,533; and depreciation, $71,008.

Financial Notes

The Colonial Trust Co. of Pittsburgh has placed over two-thirds of an issue of $2,500,000 Wheeling Steel & Iron Co. first mortgage 6 per cent serial bonds, and is offering the unsold balance at 100 and accrued interest. The bonds are secured by an absolute first mortgage, and the fixed and current assets, including the proceeds from the bonds now offered are appraised at more than $10,500,000, against only $2,500,000 par value of bonds. The maturities are in annual lots of $150,000 each from July 1, 1918, to 1923, and in $100,000 lots from July 1, 1924, to 1939. Net earnings the last six years are said to have averaged over three times the interest on the bonds.

Bank exchanges in the United States in the past week were 10.3 per cent greater than in the previous week. Compared with the first week of the war the increase is 34.6 per cent, according to the *Financial Chronicle*.

The Wilson Window Guard Co., Indianapolis, Ind., has changed its name to the Diamond Wire & Iron Works.

The Hackendorn Contracting Co., Indianapolis, Ind., has increased its capital stock from $50,000 to $125,000.

Iowa Electric Co., Cedar Rapids, Ia., has increased its capital stock from $200,000 to $400,000.

Designs Ingot Mold to Exclude Pipe

By Varying Heat-Absorptive Capacity of Upper and Lower Mold Walls

Experimenter Reduces Shrinkage Cavity Area

BY EMIL GATHMANN

DURING my experience at numerous mills in the United States, I found a decided difference of opinion among steel producers, as to what constitutes commercially sound steel. Some metallurgists insist upon having, for certain grades of steel, a so-called "open steel," one which contains numerous blowholes of various sizes, and consequently but little volume of true pipe, although a central intermittent shrinkage cavity often extends well down into the ingot. Such blowholes and pipe are expected to weld up during rolling or forging, because their surfaces are considered as not oxidized. Even if this be admitted, included slag particles and a high degree of segregation are bound to be present in the product of such ingots. Blowholes are the result of an oxidized heat and all heats, unless made or finished in the electric furnace, are oxidized more or less. Subsequent deoxidization, or rather, degasification, either in the ladle or in the mold or in both, is necessary to reduce or prevent blowholes. As is well known, a greater yield of billets or sheets is secured from the ingot by allowing the formation of blowholes, but this is undoubtedly obtained at the expense of the quality of the product. Decided segregation of carbon, phosphorus and sulphur, as well as small included slag particles, undoubtedly exists throughout the greater portion of all so-called open steel, and I believe cannot be removed by cropping.

Should Obviate Blowholes

The first requisite for sound, homogeneous steel ingots and blooms is therefore, in my opinion, to treat the steel in the furnace, ladle, and molds, so that "piping" steel is produced. The line of demarcation between harmful and so-called "harmless" blowholes is practically impossible to define. Is it not, therefore, the better and safer practice to use means for the elimination of blowholes, correspondingly reducing the segregation, and allow the formation of a well-defined shrinkage cavity or pipe at the upper end of the ingot? With the relatively cheap deoxidizers available at the present time, such as ferro-silicon, aluminum and titanium, there is no commercial reason why all steel should not be thoroughly degasified.

A degasified steel being provided, the method of freezing or solidifying the liquid steel into an ingot, and the subsequent working into blooms and thence into various products, is of great importance in reducing the crop or scrap portion of the steel, which is due to segregation and pipe. How to accomplish this reduction at a minimum expense and without upsetting the administrative mill practice of present plants, is the problem. It has been my experience that the solidifying of an ingot

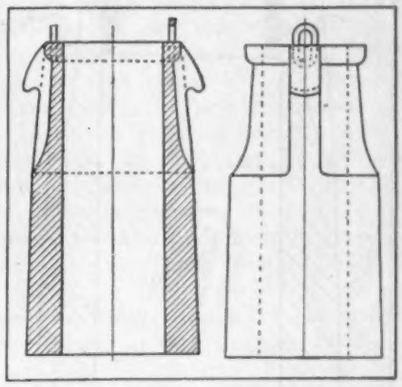


FIG. 1—GATHMANN DESIGN OF INGOT MOLD

made from steel which has been practically deoxidized or "killed" in the ladle, or in the mold, depends upon the shape of the horizontal cross-section of the ingot at its various planes from top to bottom, and also upon the thickness and consequent heat-absorptive power of the various parts of the mold walls. An ingot with its larger horizontal cross-sectional area at the top is without question the best shape for obtaining the important "lag" in solidification of the steel, and whenever such large-end-up ingots can be conveniently used it is the best practice to do so. Nearly all of our large mills are, however, so equipped for handling and stripping the ingots that it is practically impossible to do this without extensive changes in equipment.

It is, therefore, necessary to employ means in ordinary big-end-down ingots to greatly accelerate the freezing and solidifying of the lower and middle portion of the ingot and thus provide liquid metal to compensate for the decrease in volume caused by the contraction during solidification of the ingot. This I have accomplished by giving the lower 70 to 80 per cent of the metallic mold in which the ingot is cast a much greater degree of heat absorptive capacity than the upper 30 or 20 per cent thereof. At first I attempted to accomplish this by ribbing the lower exterior surface of the mold in order to provide increased radiating area, or by water or air cooling the lower and middle portions of the mold. These earlier constructions were, however, found not to be practicable for commercial use. The desired results in differential cooling were then obtained by greatly thickening the lower and middle portions of the mold walls, consequently increasing their heat-absorptive capacity, and making the upper mold wall thinner and less heat-absorptive. This type of construction will be best understood by referring to Fig. 1. Many hundreds of molds of this kind have been in daily use under usual furnace and mill conditions during the past year. Designs of molds have been made and established in actual practice for from one to ten-ton ingots.

Upper Wall of Low Heat Conductivity

In order to insure an ample supply of liquid steel to compensate for the shrinkage in the upper portion of the ingot in very dense, quick-setting steel, it was found advisable to use walls of a material of poor heat conductivity in the uppermost portion of the mold to supplement the differential effect obtained by the combination of the heavy and thin mold walls.

The usual type of sink-head resting on top of the mold, or rigidly secured in the upper part of the mold cavity, was found not to fulfill all the conditions necessary in a commercial sense, primarily because of the high cost of such sink-heads when sufficient. Sink-heads of this kind must be of sufficient thickness and strength to hold the liquid steel without cracking or breaking. Even a slight crack or break in the sink-head is sufficient to form a fin of steel and hang the ingot during its vertical shrinkage, thus causing surface cracks and defects in the body thereof.

Fig. 2 shows a method of freely suspending within the mold cavity a sink-head made of poor heat-conducting material. This type of sink-head, in con-

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junction with the heavy-wall mold, has given most excellent results, and is in regular use by several of the largest high-quality steel works in this country, in conjunction with the mold having walls with a heavy body and thin top. Such a mold, if properly designed, will produce a sound homogeneous ingot with about a 20 per cent top crop, which is about 15 per cent less than is usually necessary in ingots of like grade of steel made in the old-type mold. With a sink-head in combination with the type of mold described the crop necessary to eliminate pipe and segregation is approximately 10 to 12 per cent of the cold ingot.

Should Strip Ingots Early

When the ingots are allowed to solidify in the mold the pipe will be formed to its maximum depth. I therefore advocate a fairly early stripping and rolling of the ingot, the actual time of stripping being governed by the cross-section of the ingot. No expensive change in administrative practice is required in the production of ingots by this method, which is in use by several steel plants, and it may be readily incorporated in the practice of any of the large steel works without upsetting the casting or mill practice.

The physically homogeneous condition of the ingot is obviously of primary importance in producing sound blooms and finished products. The method of blooming such ingots, is, however, also of importance. It has been my experience that in some heating and rolling practice there is danger at times of actually forming a false pipe, or rather fissure, in the ingot. This is especially the case where the ingot has been allowed to solidify and become cold in the mold. Many mills have found it good practice to strip the mold from the ingot before its central portions have entirely solidified, and to place it immediately in the soaking pit or heating furnace in a vertical position, allowing the temperature to become equalized and the final feeding, due to shrinkage, to occur while in the soaking pit. The ingot is then rolled while the interior is hotter and more plastic than the exterior. Great care must, however, be exercised that the ingots be allowed to remain in the soaking pit until the steel is entirely set, because rolling with any green steel in the ingot will produce spongy centers. It is, therefore, necessary to determine the proper heating period before pulling specific sizes of ingots for blooming.

The best method of reducing ingots to blooms is without doubt to effect most of the reduction in butt-to-head passes, and I have seen a marked improvement in crop reduction obtained by this method of rolling, especially when the piped section was confined to the upper 20 per cent of the ingot. Irrespective of any heating and mill practice which it may be desired to use at any specified mill, the physical condition of cold ingots split open for inspection is undoubtedly the true index to the value of any method of producing sound, homogeneous steel.

The theoretically ideal method of making sound, homogeneous steel is undoubtedly with the big-end-up mold, because the increasingly large area of the ingot toward the top compensates automatically for any irregularities in the temperature of the steel or in the teeming practice.

In the commercial production of sound ingots and blooms, tonnage and quality must be taken jointly into consideration. I would, therefore, recommend, for the usual mill practice where cars or bogies are used for carrying the molds, the heavy-walled body, light-walled top, big-end-down mold; as shown in Fig. 1. I would also recommend the use of a suspended sink-head of non-conducting material, one type of which is shown in Fig. 2, to fully compensate for the contraction of the ingot.

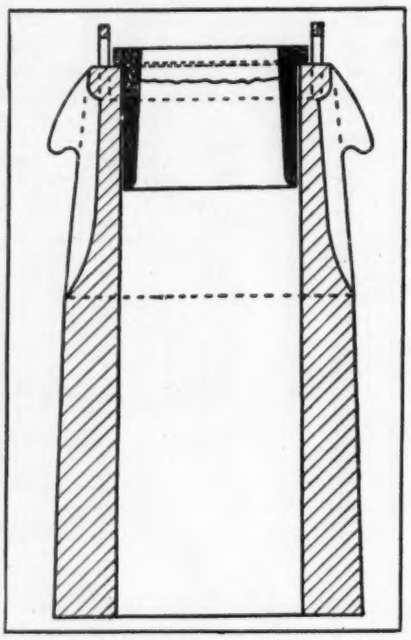


FIG. 2—SINK-HEAD IN GATHMANN MOLD

Twelve pair of goggles broken by flying chips in 10 days in the plant of the Simmons Mfg. Co., Kenosha, Wis., are the strongest kind of argument for protecting the eyes in foundry and shop. Saving 12 eye injuries in 10 days is an object lesson that should be impressive to both employer and employe.

Book Review

Chemical German, An introduction to the Study of German Chemical Literature by Francis C. Phillips, professor of chemistry, University of Pittsburgh; cloth, 252 6 x 9-inch pages, published by the Chemical Publication Co., and sold by The *Iron Trade Review* for $2.00, net.

This work is intended as a practical course in scientific German, for the purpose of aiding those who desire to read modern German chemical literature. The author states his belief that the student of scientific German needs to pay more especial attention to the nomenclature of the particular science in which he is interested. This would seem to apply all the more directly to chemical etymology, inasmuch as many of the words in common use among Teutonic chemists are at present experiencing changes in spelling, such as might easily cause confusion.

The book contains, in addition to a complete glossary, an article on orthography of disputed words. The text is in the form of reading exercises. The first of these, by the author, consist of imaginary conversations between a German professor of chemistry and a beginner in the science, and are not without gleams of refreshing humor. Excerpts from the works of German chemical writers afford practical examples of the use of words and idioms with which familiarity is desirable. Numerous explanatory notes facilitate the work of translation.

The author of the book presupposes a fair knowledge of German grammar on the part of the reader.

The Pneumercator

The Pneumercator Co., 118 Liberty street, New York, is issuing reprints of a paper read before the American Society of Naval Engineers by Henderson G. Gregory, describing the installation and operation of the pneumercator, an apparatus for measuring the depth and volume of contents of tanks, reservoirs, etc., on shipboard and elsewhere. In this paper it is stated that the pneumercator was first brought to the attention of the navy department early in the year 1913 and an installation was authorized on the battleship NEW YORK, in connection with the fuel oil tanks. The fuel oil on the NEW YORK is carried in eight double bottom tanks of various sizes and depths. A balance chamber was installed in each tank from which suitable outside connections were led to the indicator gages. Reports from the vessel on the operation of the instrument pronounced it entirely satisfactory as a means of ascertaining the depths of these fuel tanks.

Pointers on Rail Mill Practice

An Analysis of Modern Methods With Particular Reference to Roll Designing and Shrinkage Problems

BY E. STANDIFORD

THE MANUFACTURE of steel rails has reached a high state of perfection, due to the fact that the producers have availed themselves of every advantage that science and research could afford and railroad engineers have learned from experience the qualities that are most desirable under modern traffic conditions. Perfection, however, has by no means been reached and the long list of rail breakages each winter gives an approximate measure of the importance of the problems that are yet to be solved. In view of these conditions it is desirable to make a critical analysis of prevailing rail mill practice and roll designing methods as a basis for future progress. Such an analysis is attempted in this article. Particular stress is laid on rolling practice, the melting problems being less complicated. Much of the writer's data is drawn from the Ohio works at Youngstown, operated by the Carnegie Steel Co.

The ingot is bloomed at the Ohio works on a 34-inch two high mill, driven by a pair of 45 x 72-inch reversing engines with a hydraulic reversing gear. The top roll is carried by counter weights and is raised and lowered with a hydraulic screw-down. The blooming rolls are steel and have a 2½-inch hole in the center for the introduction of cooling water.

These rolls are 57½ inches long with 18½-inch necks and have three grooves, 18½-inch, 9½-inch and 7½-inch.

The ingot, which is 22 x 18 inches, is reduced to a bloom 7½ x 8 inches in thirteen passes, as shown in the accompanying table:

Pass No.	Draft, Inches.	Groove No.	Size when leaving pass.–Inches.
1	2¼	1	18 x 19½
2	2	1	18 x 17½
3	2⅛	1 edge	17½ x 15⅞
4	2⅛	1	17½ x 13¾
5	2⅛	1	17½ x 11⅝
6	2⅛	1	17½ x 9½
7	2¼	2	9½ x 15½
8	2¼	2	9½ x 13½
9	2¼	2	9½ x 11½
10	2¼	2	9½ x 9½
11	1	2 edge	9½ x 8½
12	1	2	9½ x 7½
13	1½	3	7½ x 8

It will be noticed that the drafts are heaviest in the first passes, getting lighter towards the last pass. Some rollers think that this distribution of the draft causes the steel to open up and crack more than if the drafts were light at first and heavier toward the last of the blooming, basing their opinion on the fact that the ingots have no fibre and are more or less honey-combed, in which state they do not hold together as well as after work has been done on them and their structure is fibrous and more compact.

Experiments at South Chicago

Considerable experimenting has been done at South Chicago to determine what distribution of drafts gave the best results. The ingot used in the South Chicago mill is 16¾ x 18½ inches, and is reduced to a 7¾ x 8½-inch bloom in nine passes. The blooming mill is a three high mill, so that each change in draft arrangement could only be accomplished by making new rolls, whereas, on a two high mill, the drafts can be changed with no expense by simply varying the distance the top roll is raised or lowered. After considerable experimenting, the South Chicago officials decided on the drafts they use at present, which reduced the percentage of seconds enough to more than repay them for the expense of the investigation. The following table shows the original distribution of drafts and that decided on by the experiments:

Pass No.	Original draft.–Inches.	Present draft.–Inches.
1	3⅞	1¾
2	2¹¹⁄₁₆	1⅛
3	2⅛	1¾
4	2⅞	1⅞
5	2⅛	3⅛
6	2⅛	2⅞
7	2⅛	3⅞
8	1⅞	2⅞
9	1½	3⅛
Total	20¾	20¾

The design of the passes in blooming mill rolls is not such a difficult matter in a two high as in a three high mill, because in the former it is impossible to give the passes much shape, while in a three high mill, the piece goes through each pass but once, and the pass can be shaped to the best advantage. In all square passes, such as blooming mill passes, it is the aim to get as much side work on the piece as possible, to counteract the tendency of the steel to shear. The latter is due to there being greater elongation on the top and bottom of the piece caused by the up and down work, than on the sides where there is much less work. It is impossible to get the elongation equal on all sides because it is impossible to have the work equal on all sides of a rectangular bar, except in a universal mill, but that condition can be more nearly reached in a three high than a two high blooming mill.

This shearing tendency, due to unequal elongation, besides being greater in a two high than in a three high mill, is not counteracted as much in the succeeding passes. In a two high mill the piece goes back and forth two or four times before it is edged up and work done on the opposite sides, while in the three high mill, the piece has work done on the opposite side in each alternate pass which tends to remedy the harm done by the unequal elongation.

The best that can be done, then, in designing passes for two high rolls is to make the radii large and have taper on the collars, so that when the piece does fill the pass there will be work done on the corners and part way on the sides, which will help to heal up the cracks. Aside from providing suitable radii in the corners of the passes and making the passes of the proper width to suit the drafts decided upon, there is little else to be observed in laying out the blooming mill roll passes, except the swell in the bottom of the grooves. This swell is put in the bottom of the pass to reduce the thickness more in the center than at the edge, so that when the piece is edged up in the following pass it will have room to spread without overfilling the pass, causing a seam that would carry through to the finished rail. The amount of swell depends on the amount of spread the piece will have in the different passes, which is a variable quantity depending on the composition of the steel and the temperature at which it is rolled. The bloom coming from the mill is from 30 to 40 feet long, depending upon the length the ingot was poured, which is governed by the section of rail to be rolled. This long bloom on its way to the rail mill passes between the knives of the bloom shears, where the front end is lopped off back to the solid steel

and then sheared into blooms of suitable length to make two or three rails, depending on the section to be rolled.

Designing the Rail Mill Passes

The first six passes at the Ohio works are called the roughing passes and the last five the finishing passes. The finishing passes are laid out first, using the finished rail section for starting point and working back through the other finishing passes, which will be different for each different section of rail.

The roughing passes are designed to suit the size of bloom to be used and provision must be made to have them so constructed that different sections of rail can be made without changing the roughing rolls for each change in section. The most important thing in designing the finishing passes is to have the work equal in the head, web and flange; that is, to have the percentage of reduction as nearly equal as possible in the three parts of the rail. Every effort is made to do this, but certain requirements must be met, which makes it impossible to carry this out to the letter.

To get the exact area of the finishing or the last pass, the following calculation was made. The specific gravity of steel, as given by good authority, is 7.854, which figure has been confirmed by experiments made with bessemer steel at Joliet, Ill.

Weight per cubic inch = sp. gr. × 0.036085 — Kent, pg. 163, hence weight per cubic inch = 7.854 × 0.036085 = 0.2832 pound.

A bar of steel 1 square inch in cross section and 1 yard long would weigh 36 × 0.2832, or 10.195 pounds; therefore, a rail weighing 70 pounds per yard would contain 70 ÷ 10.195 = 6,863 square inches. The rail will have a greater area hot than cold. It is assumed that the steel, at the temperature at which the rail is finished, has an expansion of 3/16 inch per foot at least. In all rail mills hot templates are laid out with a shrink scale having this amount of shrinkage per foot and the finished rail is of the correct weight.

Now, if in a foot the shrinkage is 3/16 inch, equivalent in decimals to 0.1874 inch, to produce a cold bar 1 foot long we must shear the hot bar to a length of 1.01575 feet. Likewise a bar 1 inch square cold will be 1.01575 inches square hot and will have an area of 1.031 square inches. Since the area of the 70-pound section given above is 6.863 square inches cold, the hot section will have an area of 6.863 × 1.031, or 7.075 square inches. The finishing pass was accordingly laid out to A. S. C. E. dimensions with a shrink rule having a shrinkage of 0.1875 inch per foot. This was done very accurately with fine lines on bristol board and the area gone over very carefully with a planimeter, which gave the area 6.99 square inches, showing a difference of only 0.08 square inch from that called for by the above calculations; in other words, the 70-pound A. S. C. E. rail is a trifle less than 70 pounds.

The other sections also show slight variations. This, then, is the design of the finishing or No. 11 pass, except that the flange in the closed roll is opened up 1/64 inch from a point ½ inch below the center line, which, besides allowing the rail to deliver free, makes the base of the rail a trifle concave, which is desirable. It guards against a convex base, a serious defect in a rail. Careful work with the planimeter showed that the 6.99 square inches of area were distributed as follows:

	Square inches.
Head	2.92
Web	1.5
Flange	2.57

or in percentage:

	Per cent.
Head	41.77
Web	21.46
Flange	36.77

It has been the aim in the remainder of the finishing passes to keep the distribution of area as close to the percentage of the finished rail as possible after meeting other requirements demanded in the design. How successfully this has been done will be seen by referring to the table showing the drafts in each pass.

There has been a trifle more work on the head than on the flange in each case, because the flange cools quicker than the head and is therefore harder to reduce. If this fact were disregarded, the piece would have a tendency to deliver crooked.

Pass No. 10, called the "leader", is constructed to bring the piece as near to the shape and size of the finished rail as possible. As designed, it requires a reduction of only 3.59 per cent to make the finished rail. The height is made 1/16 inch less than the finisher to allow for spread. The closed flange is made the same length as the finisher, as it will not lengthen with such slight draft. The open flange is made ⅛ inch longer than the closed flange in the finisher, so that the same angle makes it thin enough to go to the bottom of the closed flange in No. 11 pass, and the additional length will insure the work being done on it, filling the corners and giving the desired width. The fillets on head and flange are made 1/32 inch greater than on finisher, to give a little work at these points in working out the ¼-inch fillets to hold the piece in place. The head is longer on both sides than No. 11 pass to give enough to fill out the crown to 12-inch radius and fill under the head to give a tight fit on the splice bar. There is only 1/64 inch up and down work required on the web, but this is enough to give the brand, while more work would tend to pull the metal away from the flange.

Edging Pass Work Varies

In all passes of this construction, which are called edging passes, there should be more up and down work on the flange than on the head, and more on the head than on the web. This is made necessary because the diameter of the rolls are different at each point and therefore have different peripheral speeds, which causes the metal to flow differently, pulling away from the slower moving parts of the rolls more than from the faster traveling parts.

Pass No. 9, called the second edger, is very similar in design to No. 10, but the work is 19.72 per cent instead of only 3.59 per cent. The height is 3/32 inch less than No. 10, to allow for spread, which will be greater here than in No. 10, because of the greater reduction in the web than the open flange in No. 10. The open flange is made 3/16 inch longer from the edge of the web than the closed flange in No. 10 to give the closed flange from the preceding pass a chance to lengthen, which will make it thin enough to go into the closed flange of No. 10.

The fillets are made larger than in the leader to give work at these four points, which steadies the piece in the pass. The head is made wider, 1/16 inch on the closed side and ⅛ inch on the open, to allow enough up and down work to force the steel to fill the head, which it would not do otherwise, because it is necessary to carry a great deal more stock in the head from No. 8 than is needed. This makes the head thick and keeps it from entering the groove readily. The web is made thin enough to give the portion of work necessary to keep the percentage as near that required as possible, but on account of the large diameter of the rolls at this point the up and down work should not be great.

No. 8, called the first edger, is a very important pass, for, unless it is designed so that it will fill properly, the following passes will not work as designed. The height is made 3/32 inch less than No. 9, to allow for spread. The closed flange is made 1/32 inch shorter than the long flange of No. 9 from the edge of the web

to allow for its lengthening a trifle. The open flange is made 9/16 inch longer from the side of the web and the angle of the flange is made a little greater than No. 9, so that the flange will be thin enough to go home in the closed flange of the second edger. If successful in this, there is not much danger of a narrow flange, for most causes of narrow flanges come from the failure to bottom in the closed flange in this and the following passes. There is a little more than a ½-inch up and down work on the head, which will keep the metal from pulling away from the head, which it is very likely to do, as there is much heavy work on the web. For this same reason the fillets on head and flange are made larger. The corners of the head are well rounded to keep the steel from overfilling in the open roll, which would cause a fin. In this, as in all the edging passes, the flange is turned a trifle from the line perpendicular to the center line, flaring out from the closed roll flange. This is done so that the piece will deliver freely from the pass without wearing the rolls excessively.

In the second edger and finisher, where it is more important that the rolls hold their shape, the head is also turned from the perpendicular. The rolls wear much less when this is done and because of the taper, they can be brought to the correct height with less dressing when they do become worn.

No. 7 is called the finishing dummy. It is the first of the finishing passes and is called a dummy pass because it does not assist much in shaping the rail nor does it reduce the area except by a small percentage. This pass is used to squab the piece down to the proper height to permit the spread in the following passes. Its most important function, however, is to make the flange thin. The longer flange coming from No. 6 is 11/16 inch thick at the point, while the same flange is only ¼-inch coming from the dummy; so it is seen that the flange is made much thinner and consequently longer in this pass.

It is to be noted that one flange is longer and thinner than the other. The longer flange is the one that goes into the closed roll of No. 8 and must bottom in that pass or loss of width of flange would result, which defect would carry right through the balance of the finishing passes.

The width of the head is made just enough greater than No. 8 to give the amount of up and down work desired and the corners are well rounded to prevent overfilling in the succeeding passes, which would cause a fin. The top of this pass is made V-shaped to help force the metal out of the flange. As the rolls wear, the top roll must be lowered or the flanges will become too thick to enter the closed roll in No. 8. Frequently the top roll of the dummy is made a chill roll, so that the wear will not be so great. This then completes the design of the finishing passes.

The light and heavy sections cannot be made from the same roughing passes as there is such a difference in the amount of stock required to make the different sections. Sections from 50 to 70 pounds are made with the same roughing passes and sections from 70 to 90 pounds are made on another set of passes. For all sections, the first four roughing passes remain the same, the change from the light to the heavy sections requiring a change in the last two roughing passes.

While the design of the roughing passes is not so particular as that of the finishing passes, there are a number of precautions to be observed or the passes will not work properly. The biggest difficulty in these passes is to get the reduction and shape the rail without making the flange too narrow.

In all the finishing passes the work that is done in shaping the rail tends to make the flange narrow, so that it is necessary to have the flange coming from the roughing passes wider than is required in the finished rail. To accomplish this, different style passes are alternated in such a manner that the edging passes, which do so much toward shaping the rail and thereby making the flange narrow, are followed by squabbing or dummy passes that do little or nothing toward shaping the rail but keep the height down and roll out the flange, making it thinner.

Passes No. 1 and 2 are box passes and in both the reduction is heavy. These passes make the piece narrower in the head and shorter in height. The up and down work necessary to reduce the height causes the piece to spread and begin to form the flange, which effect is exaggerated by putting a swell on the bottom of the passes; this also prevents the piece from overfilling in the succeeding edging pass, which would cause a seam.

No. 3 is called an edging pass because the piece entered on edge, that is, turned through 90 degrees from the position it was going through Nos. 1 and 2. In this pass the piece begins to get the shape of the rail, considerable more work being done on the web than on the head and flange. The part of the rolls that reduce the web is made quite sharp; that is, 9/16-inch radius rather than presenting a wide surface at that point, which would tend to pull the metal away from the flange more than would the narrow tongue. The swell made in the top and bottom of No. 2 prevents the piece from overfilling the pass when it spreads.

No. 4 is a dummy pass and does nothing toward shaping the rail, but makes the piece lower and the flange wider. The height is squabbed down to 4 3/16-inch in this pass and the top and bottom are made concave again to allow the piece to spread in the two following edging passes without overfilling.

In order to assure stock enough for the heavier sections, passes 5-H and 6-H are laid out for sections from 70 to 90 pounds as well as passes Nos. 5-L and 6-L for sections under 70 pounds. By reference to the table below showing percentage of reduction, the difference in the draft for the light and heavy section is seen.

Both Nos. 5 and 6 are edging passes and in both considerable work is done on the web of the piece. As in No. 3, effort is made to get the reduction and shape the piece without pulling the metal away from the flange any more than is necessary. The flange and head are tapered off in both rolls in these passes so that the piece is free to deliver itself without undue wear of the rolls. No. 6 is the first pass in which one side of the flange is made longer than the other. This is done so that the piece as it comes out

(*Continued on Page 332c.*)

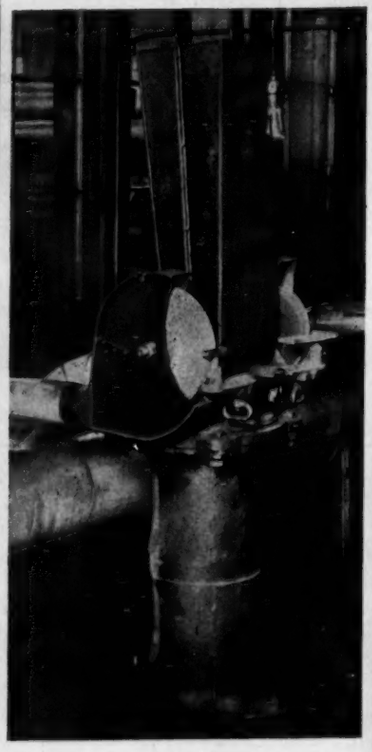
TABLE SHOWING AREA AND REDUCTION OF RAIL IN VARIOUS PASSES

Pass	Area, Square inches.	Reduction, per cent.	Head, Area.	Head, Per cent.	Web, Area.	Web, Per cent.	Flange, Area.	Flange, Per cent.
1.....	46.32	22.8	5.14	43.34	2.48	20.91	4.24	35.75
2.....	36.63	20.92						
3.....	29.58	16.05	3.75	41.52	1.93	21.37	3.55	37.10
4.....	23.23	21.5						
5.....	19.85	14.5	3.02	41.65	1.55	21.38	3.68	36.96
6.....	16.52	16.7						
5-H	21.87	5.84	2.92	41.77	1.50	21.46	2.53	36.77
6-H	18.14	17.05						
7.....	15.67	5.2						
8.....	11.86	23.68						
9.....	9.03	23.86						
10.....	7.25	19.72						
11.....	6.99	3.59						

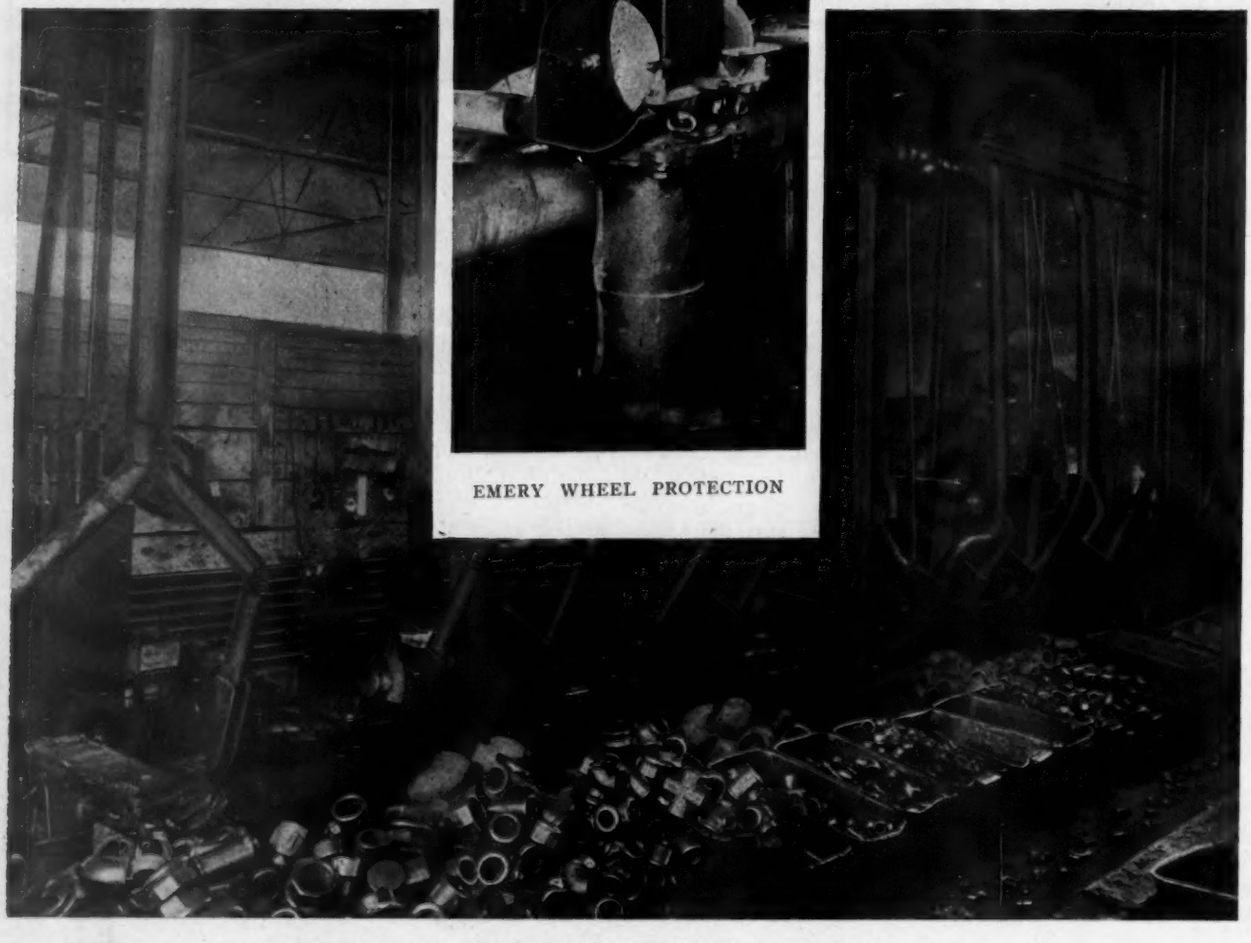
How Large Steel Companies Protect

GRINDING WHEELS EQUIPPED WITH

EXHAUST PIPE TO DRAW OFF DUST

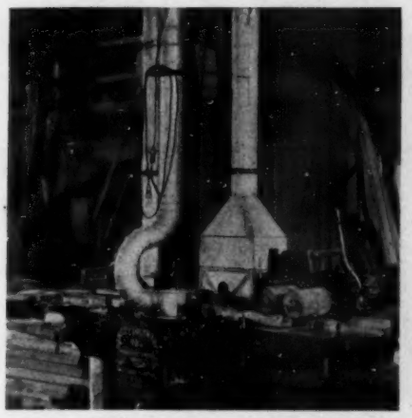


EMERY WHEEL PROTECTION

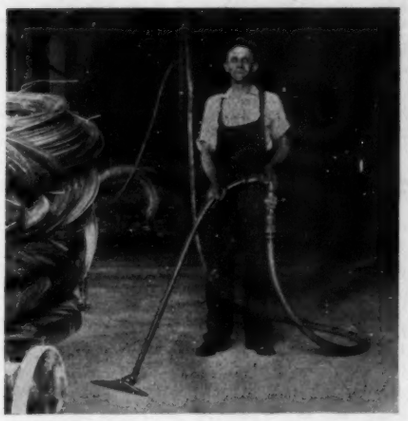


ANNEALING DEPARTMENT, NATIONAL TUBE CO., KEWANEE,. ILL.

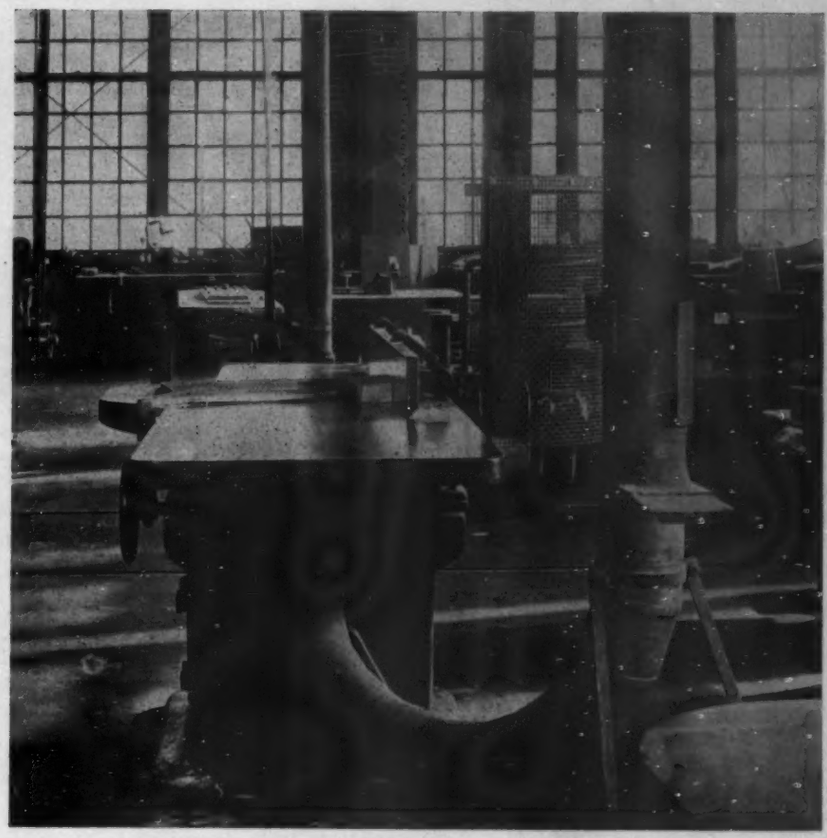
Workmen Against Dust Dangers



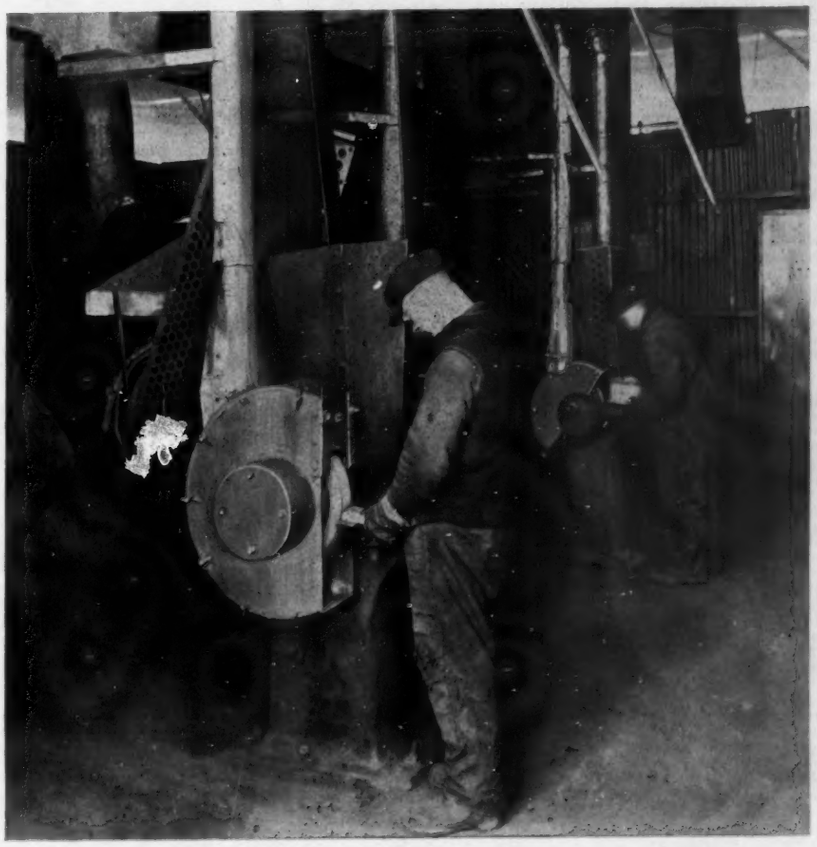
OVER-DRAFT DUST COLLECTOR ON MOLDING MACHINE



VACUUM CLEANER IN WIRE MILL



PATTERN ROOM, BUCKEYE STEEL CASTINGS CO., COLUMBUS, O.



GRINDING ROOM IN FOUNDRY, ILLINOIS STEEL CO., CHICAGO

RESPIRATORS, GOGGLES AND HELMET FOR SAND-BLAST OPERATOR

DUST COLLECTOR IN PATTERN SHOP

New York State Rules for Foundries

Regulations Adopted by That Commonwealth to Control Operations in Casting Plants

RULES relating to the equipment, maintenance and sanitation of foundries as well as to the employment of women in core rooms, adopted by the industrial board of the state of New York and which are now in effect, are of great interest to foundrymen generally, owing to the agitation in other states for the formulation of similar codes. In both Ohio and Pennsylvania, rules have been prepared and it is probable that they will be adopted in the near future. A wide range of subjects are covered by the New York State rules including drafts, ventilation, sanitation, safety, women coremakers, construction and installation, first aid and general comfort.

In the following, the law is printed in italics, the rules appearing immediately thereafter:

Definitions

Rule 550.—An iron or steel foundry shall mean a place where iron or steel or both metals are melted and poured into sand molds in the making of castings, together with all cleaning, coremaking, drying, wash rooms and toilet rooms, used in connection therewith.

Rule 551.—The term "entrance", as used in these rules, shall mean main doorways opening directly to the outer air.

The term "gangway", as used in these rules, shall mean well-defined passageways dividing the working floor of foundries, but not the spaces between molds. Spaces between molds shall be divided into three classes, which shall be known as "bull-ladle aisles", "hand-ladle aisles" and "buggy-ladle aisles".

Rule 552.—Unless otherwise specified these rules shall, as to the subjects covered therein, exempt foundries from the provisions of rules relating to such subjects.

Entrance and Windows

All entrances to foundries shall be so constructed and maintained as to minimize drafts, and all windows therein shall be maintained in proper condition and repair.

Rule 553.—Entrances to foundries shall be protected from Nov. 1 to April 1 of each year by a covered vestibule, either stationary or movable, which shall be so constructed as to eliminate drafts and of such dimensions as to answer ordinary purposes, such as the passage of wheel-barrows, trucks and small industrial cars. This rule shall not apply to entrances used for railroad or industrial cars handled by locomotives or motors, or for traveling cranes, horse-drawn vehicles or automobiles; these entrances may remain open only for such time as is necessary for the ingress and egress of such cars, trucks and cranes, horse-drawn vehicles or automobiles.

No locomotive shall be permitted to remain inside the foundry during the loading or unloading of the cars.

Gangways

All gangways in foundries shall be constructed and maintained of sufficient width to make the use thereof by employes reasonably safe; during the progress of casting such gangways shall not be obstructed in any manner.

Rule 554.—Main gangways where iron is carried by hand, bull or truck ladles shall be not less than 5 feet wide. Truck-ladle gangways which are not main gangways shall be not less than 4 feet wide. Bull-ladle aisles between floors shall be not less than 3 feet wide. Single hand-ladle or buggy-ladle aisles between floors shall be not less than 18 inches wide. Where trolleys are used over molding floors for pouring metal, the aisles shall be of sufficient width to permit the safe ingress and egress of employes and the safe use of the ladles. Where it is necessary to occupy the central portion of the floor space in the production of molds, continuous gangway space shall be provided.

Rule 555.—During the progress of casting every gangway or aisle shall be kept entirely free from pools of water or obstructions of any nature. Every gangway shall be kept in good condition at all times. Every gangway where industrial tracks are used shall be constructed of a hard material of substantial character and the top of the rail shall be flush with the floor.

Removal of Smoke, Steam, Gases and Dust

Smoke, steam and gases generated in foundries shall be effectively removed therefrom, in accordance with such rules and regulations as may be adopted with reference thereto by the industrial board, and whenever required by the regulations of such board, exhaust fans of sufficient capacity and power, properly equipped with ducts and hoods, shall be provided and operated to remove such smoke, steam and gases. The milling and cleaning of castings, and milling of cupola cinders shall be done under such conditions to be prescribed by the rules and regulations of the industrial board as will adequately protect the persons employed in foundries from the dust arising during the process.

Rule 556.—Where smoke, steam, gases or dust arising from any of the operations of the foundry are dangerous to health and where a natural circulation of air does not carry off such smoke, steam, gases or dust, there shall be installed and operated hoods, ventilators, fans or other mechanical means of ventilation approved by the Commissioner of Labor.

Rule 557.—Where fumes, gases and smoke are emitted from drying ovens in such quantities as to be detrimental to the health or comfort of employes, hoods and pipes or exhaust fans or other mechanical means shall be provided over the doors of such ovens; hoods and pipes will not be required where they would interfere with the operation of traveling cranes, but other effective means shall be provided for the removal of such smoke, gases and fumes.

Rule 558.—The cleaning and chipping of castings shall be done in cleaning rooms except that where traveling cranes or where, in existing installations cars are used for conveying castings into such rooms, a separating partition shall be erected which shall be not less than 12 feet in height. In existing installations, where the crane cage or crane girders will not permit the erection of a 12-foot partition, the height of the partition may be reduced sufficiently to permit of the clearance of same. Large castings may be chipped or cleaned by hand in the molding and casting room provided sufficient protection is furnished by the use of a curtain or screen or some other means equally good to protect employes who are otherwise employed therein.

This rule shall not apply if mechanical contrivances are used for cleaning castings and the dust and particles arising therefrom are effectively removed at the point of origin by means of an exhaust system.

Rule 559.—Where tumbling mills are used, exhaust systems shall be installed to effectively carry off the dust arising from the cleaning of castings, except where the mill is operated outside the foundry. This rule shall not prohibit the use of a water barrel to clean castings. Sand blast operations shall be carried on in the open air or in a separate room used solely for such purpose. The milling of cupola cinders, when done inside the foundry, shall be carried on by an exhaust mill or water mill, each of a type approved by the Commissioner of Labor.

Rule 560.—The floor beneath and immediately surrounding the cupola shall slope and drain away from the base of same.

Rule 561.—No cores shall be blown out of castings by compressed air unless such work is done outside the foundry or in a special room or dustproof enclosure approved by the Commissioner of Labor. Men employed in cleaning castings by compressed air or sand blast shall wear eye guards and helmets.

Lighting and Heating

All foundries shall be properly and thoroughly lighted during working hours.

Rule 562.—Where natural light is insufficient properly to light the foundry, artificial light of sufficient power shall be provided, in the discretion of the Commissioner of Labor.

Rule 563.—Interior walls of foundries shall be whitened, in the discretion of the Commissioner of Labor.

Rule 564.—Proper and sufficient heat shall be provided and maintained in every foundry. Open fire may be used for the drying of molds or cores if coke containing less than 1 per cent of sulphur is used; also charcoal, gas or oils may be so used; where practicable, such drying of molds or cores shall be done at night.

Rule 565.—All hand and bull-ladles shall be dried in ovens or outside of the foundry. A sufficient number of sheet iron shields shall be available in iron foundries for use in covering hand and bull-ladles.

In all foundries suitable provisions shall be made and maintained for drying the working clothes of persons employed therein.

Rule 566.—Suitable facilities shall be provided for the thorough drying of employes' clothing. Such facilities may be located in the washroom, the locker room, or in a room used exclusively for such purpose.

Sanitary Conveniences in Foundries

In every foundry in which 10 or more persons are employed or engaged at labor, there shall be provided and maintained for the use of employes therein suitable and convenient washroom of sufficient capacity adequately equipped with hot and cold water service; such washrooms shall be kept clean and sanitary and shall be properly heated during cold weather. In every such foundry lockers shall be provided for the safe keeping of employes' clothing. In every foundry in which more than 10 persons are employed or engaged at labor where water closets or privy accommodations are permitted by the Commissioner of Labor to remain outside of the factory, the passageway leading from the foundry to the said water closet or privy accommodations shall be so constructed that the employes in passing thereto or therefrom shall not be exposed to outdoor atmosphere and such water closets or privy accommodations shall be properly heated during cold weather.

Rule 567.—Water closets shall be provided in every foundry and for each sex, according to the following table:

Number of persons.	Number of closets.	Ratio.
1 to 10	1	(1 for 10)
11 to 25	2	(1 for 12½)
26 to 50	3	(1 for 16⅔)
51 to 80	4	(1 for 20)
81 to 125	5	(1 for 25)

For every unit of 45 or fractional part

thereof in excess of 125 persons employed, one additional water closet shall be provided.

Rule 568.—Where more than 10 and less than 30 males are employed at one time there shall be provided one individual urinal; where more than 30 and less than 80 males are employed, two urinals shall be provided, and thereafter one individual urinal shall be provided for every 80 men employed or fractional part thereof. At least two linear feet of trough or slab urinal shall be considered the equivalent of one individual urinal.

Rule 569.—Wash basins with faucets for hot and cold water shall be supplied according to the following table:

Number of persons.	Number of wash basins.	Ratio.
1 to 8	1	(1 for 8)
9 to 16	2	(1 for 8)
17 to 30	3	(1 for 10)
31 to 45	4	(1 for 11¼)
46 to 65	5	(1 for 13)

For each additional 25 employes at least one additional wash basin shall be supplied. Twenty inches of sink shall be considered the equivalent of one wash basin.

Rule 570.—Washrooms hereafter installed where 20 or more men are employed shall be provided with at least one shower bath with an ample supply of hot and cold water, and for every additional 100 men one additional shower bath shall be provided.

Rule 571.—Individual lockers, arranged for locking, shall be provided for employes and shall be placed in a room used exclusively for such purpose, in the washroom, the drying room, or at convenient places in the molding room. In cases of dispute the necessity for and the number of such lockers shall be determined by the Commissioner of Labor.

Rule 572.—The general provisions of the Industrial Code shall apply in all matters not specifically covered in Rules 563 and 567 to 570 inclusive.

Maintenance

The flasks, molding machines, ladles, cranes and apparatus for transporting molten metal in foundries shall be maintained in proper condition and repair, and any such tools or implements that are defective shall not be used until properly repaired. There shall be in every foundry, available for immediate use, an ample supply of lime water, olive oil, vaseline, bandages and absorbent cotton, to meet the needs of workmen in case of burns or other accidents; but any other equally efficacious remedy for burns may be substituted for those herein prescribed.

Rule 573.—Ladles, shanks, tongs, slings and yokes used in the pouring of molten metals shall, prior to their use, be inspected daily as to their safety, by the men preparing and using same, and in addition a regular inspection as to their safety shall be made once a month by a man designated for that purpose. A monthly inspection shall also be made of the chains and cables on counterweights used in connection with drying ovens. Reports of such inspections shall be made on forms prescribed by the Commissioner of Labor, and shall be kept on file for his examination.

Rule 574.—All fire ways connected with drying ovens, when built in the floor, shall at all times be protected by either a substantial protecting cover or a standard rail as defined in rules relating to dangerous machinery.

Rule 575.—All trap doors shall be guarded when open, either by standard rails as described in Rule 574 or watchmen, and all pits shall be properly covered or railed when not in use, and sufficiently guarded at other times.

Rule 576.—All passageways and stairways shall be properly lighted, and inclined runways and stairways, charging decks and platforms shall be safeguarded with standard rails as described in Rule 574.

Rule 577.—All pouring ladles of 2,000 pounds capacity or more shall be equipped with a geared device for tilting same. All pouring ladles shall be so constructed that the center of gravity shall be below the bail, and shall be equipped with a clip to prevent overturning.

Rule 578.—Trunnions on flasks shall be capable of sustaining the loads they are required to handle. Trunnions hereafter constructed shall be carefully designed to carry the load they are to handle and constructed with a factor of safety of at least 10, including bolts where they are used. The diameter of the button shall be equal to the diameter of the groove plus one and one-half times the diameter of the sling used to handle the flask. The side corners shall be well filletted and in order to prevent the sling slipping off or riding the button, the radius of the corner between groove and button shall be approximately equal to the radius of the sling used, the remainder of the inside edge of the button to be straight. All trunnions constructed after April 15, 1915, shall bear the date of their construction.

Rule 579.—The use of high explosives on the foundry premises for the breaking of castings is prohibited unless effective protection is provided.

Rule 580.—The breaking of castings by the use of a drop inside the foundry during working hours is prohibited. Where a drop is used for the breaking of castings outside of the foundry a permanent shield of heavy planking or other effective protection shall be provided.

Rule 581.—Every employe shall use safety devices furnished for his protection by the employer, where there is a hazard connected with his employment.

Regulations for Coremaking Rooms in Which Women are Employed

No female shall be employed or permitted to work in any brass, iron or steel foundry, at or in connection with the making of cores where the oven in which the cores are baked is located and is in operation in the same room or space in which the cores are made. The erection of a partition separating the oven from the space where the cores are made shall not be sufficient unless the said partition extends from the floor to the ceiling, and the partition is so constructed and arranged, and any openings therein so protected that the gases and fumes from the core oven will not enter the room or space in which the women are employed.. The industrial board shall have power to adopt rules and regulations regulating the construction, equipment, maintenance and operation of core rooms and the size and weight of cores that may be handled by women, so as to protect the health and safety of women employed in core rooms.

Rule 582.—Where rooms in which core ovens are located adjoin rooms where cores are made by females and where the making of cores and the baking of cores are simultaneous operations, the partition between such rooms shall be constructed of concrete, hollow tile, brick, metal, or wood covered with metal, or other material approved by the Commissioner of Labor, and there shall be in such partition only such openings as are required by the nature of the business.

Rule 583.—All openings in partitions between the core oven room and the room in which females are employed shall be vestibuled with a revolving device or double doors which shall be self-closing, or any other self-closing device equally effective, which shall be approved by the Commissioner of Labor. Such device shall be kept in such condition that gases, fumes and smoke shall be effectually trapped.

Rule 584.—No female shall be allowed to handle cores which have a temperature of more than 110 degrees Fahr.

Rule 585.—No female shall be permitted to make or handle cores when the combined weight of core, core box and plate at which she is working exceeds 25 pounds.

Brass Foundries

Rule 586.—Definitions. A brass foundry shall mean a place where brass, aluminum, copper, tin, zinc, gold, silver or composition metals containing any of the foregoing metals are melted or poured into sand molds in the making of castings, except that foundries where aluminum only is melted shall be covered by rules governing iron and steel foundries.

The term cellar when used in these rules shall mean a room or part of a building which is one-half or more of its height below the level of the curb on the ground adjoining the building (excluding areaways).

The term basement when used in these rules shall mean a room or part of a building which is one-half or more of its height above the level of the curb.

Rule 587.—The rules relative to dust, smoke, gases or fumes, ventilation, sanitation, heat, light, gangways and aisles, safety appliances, washrooms, cleaning rooms, drying and locker accommodations, as specified for iron and steel foundries, shall apply to brass foundries, except that main gangways shall be not less than 4 feet wide and gangways between molds on spill troughs shall be not less than 3 feet wide.

Rule 588.—When the crown plate of an upright melting furnace is elevated above the surrounding floor in excess of 12 inches, the furnace shall be equipped with a platform with a standard rail; such platform shall be constructed of metal or other fireproof material, and shall extend along the front and sides of the furnace, flush with the crown plate and shall be at least 4 feet in width and shall be clear of all obstructions during pouring time. If the platform is elevated above the floor in excess of 12 inches, the lowering from same of crucibles containing molten metal shall be by mechanical means.

Rule 589.—When the combined weight of a crucible, tongs and molten metal exceeds 100 pounds, it shall be removed from the furnace and deposited on the floor by mechanical means.

Rule 590.—When smoke finish is desired on molds made on benches or tubs, smoke boxes which shall effectually trap the smoke shall be used; such boxes to be connected with flues to the outer air.

Rule 591.—When molders work side by side at least 5 feet of space sideways shall be allowed for each man, and a clear space of 3 feet shall be provided back of each man.

Rule 592.—Hoods shall be provided directly above all brass melting furnaces using gas or oil as fuel, which will effectually trap all gases and fumes generated in the melting of the metal; such hoods shall be provided with outlet pipes to lead the gases or fumes to outer air.

Ventilators shall be provided over all other furnaces used for melting brass or composition metal, to effectually remove the gases above the furnaces.

Rule 593.—Brass foundries shall be provided with natural light from at least two sides or from at least one side, and skylights in roof.

Rule 594.—All persons removing pots containing molten metal from furnaces or handling such pots shall be provided with protection for legs and feet.

Rule 595.—Gangway dirt and floor scrapings shall not be riddled in the room where workmen are employed, unless it is so dampened as to prevent dust arising therefrom.

Rule 596.—Stoves used for drying molds, when located in the rooms used by workmen, shall be surrounded by a casing of fireproof material, to the full height of the stove.

Rule 597.—No brass foundry shall hereafter be constructed with a clearance less than 14 feet between the lowest point of the ceiling and the floor, except that where a peak, sawtooth, monitor or arch roof is constructed the side walls may be of a minimum height of 12 feet.

Rule 598.—No foundry shall hereafter be located in a cellar or basement unless the ceiling shall be at least 14 feet in height, measured from the finished floor to the under side of the ceiling; and, if the foundry is located or intended to be located entirely in the front part of the building, unless the ceiling shall be in every part at least 6 feet 6 inches above the curb level of the street in front of the building; or, if the foundry is located or intended to be located entirely in the rear part of the building, or to extend from the front to the rear, unless the ceiling shall be not less than 3 feet above the curb level of the street in front of the building, and the foundry shall open upon a yard or court which shall extend at least 6 inches below its floor level; nor unless proper and adequate provision shall be made for lighting and ventilation.

Rule 599.—In case any foundry that was legally operated in a cellar or basement on Jan. 1, 1915, shall be discontinued or unused for a period of more than four consecutive months, it can thereafter be reopened as a foundry only by complying with the provisions of the rules relating to future foundries. The occasional operation of a foundry for the purpose of evading this rule shall not be deemed a continuance of use thereof.

First Aid Outfit

In the code governing the sanitation of factories and mercantile establishments, the following rules relating to a first aid outfit apply:

Rule 178.—In every factory employing more than 10 persons, in which power-driven machinery is used for manufacturing, there shall be provided a first aid kit at all times free of expense to employes. The commissioner may require such equipment to be furnished in mercantile establishments. A suitable and easily accessible space shall be set aside to administer first aid, which will insure a reasonable amount of privacy both to the injured and the person rendering first aid. There

(*Continued on page 332b.*)

Grinding Wheels for Foundry Use

The Abrasive Problem for Casting Work is Discussed in All Its Phases and Practical Suggestions Are Made

BY CARL FREDERICK DIETZ

THE development of the modern grinding wheel has been practically simultaneous with the development of the modern foundry. It would be impossible to conceive of a foundry with the melt running into hundreds of tons, removing the fins and spurs of its castings by means of chisel and file. A grinding wheel is both in one—a massive aggregation of little cutting tools bonded together in such a manner that their high speed of rotation provides an opportunity for the rapid and economical removal of large quantities of metal, doing in a few moments what could only be accomplished by endless manual labor with hand tools, if indeed at all. It required years of patient study of abrasives, bonds, burning conditions and the many other factors entering into its construction to develop this tool, with the result that, while in general appearance the modern article is not unlike that made a quarter of a century ago, it is an advanced product. It calls upon the services of skilled engineers from the time the raw material is mined, through the stages of its conversion in electric furnaces into an artificial abrasive of high purity and uniform quality, and its final preparation and bonding into a homogeneous mass wherein the best skill and cunning of the ceramist is called upon to verify the bonds to a degree of nicety hardly attempted even by the makers of the world's finest pottery.

Although the grinding wheel made by the vitrified process has the greatest interest for the foundryman, many other bonding materials are used, notably the organic mixtures employed in the manufacture of elastic or vulcanite wheels, and the salts which are used in the construction of silicate wheels. Grinding or snagging of castings must by the very nature of the operation, be classed as rough work, which fact immediately establishes, in a general manner at least, the type of wheel to be considered, from coarse to medium in grain, and hard in grade.

The characteristics apply to practically all foundry wheels, whether the material to be ground is steel or its alloys, cast or chilled iron, brass, bronze or any other product.

The specific combination of grain and grade as well as the abrasive material itself is controlled by many factors. Grain and grade are influenced by such various circumstances as:

1.—Speed of wheel.
2.—Condition of machine, whether massive and rigid or light and shaky.
3.—Contact, large or small, of course with reference to its dressing action upon the wheel.
4.—Method of application, whether floor stand, swing frame or flexible shaft grinder.
5.—Ability of operator, whether trained to consider the wheel a valuable cutting tool or not.
6.—Character of material, hard or soft, high or low tensile strength.
7.—Finish required, whether rough surface as left by a coarse wheel is satisfactory or whether a smooth surface is sought.

The selection of abrasive material is, aside from possible commercial considerations, almost entirely dependent upon the character of the material which is intended to be ground. Wheels are made up in many combinations of grain sizes and a number of grades of hardness. In foundry practice it is found that grain sizes from 8 to 30 include practically all operations while the grades or relative hardnesses vary from P to U or W, with all the intermediate letters designating a certain grade. The alphabet is used to denote grade by employing the beginning of the alphabet to denote soft wheels.

Grain size is measured by the mesh of the screen or number of openings per linear inch over which the ground abrasive is sieved, while grade is a relative measure of hardness and represents the tenacity with which the bond holds the grain particles together. Thus, wheels are being made so soft as to enable one to rub the particles away quite readily with the fingers while others are made so hard that specially devised instruments and apparatus are necessary to true or size them.

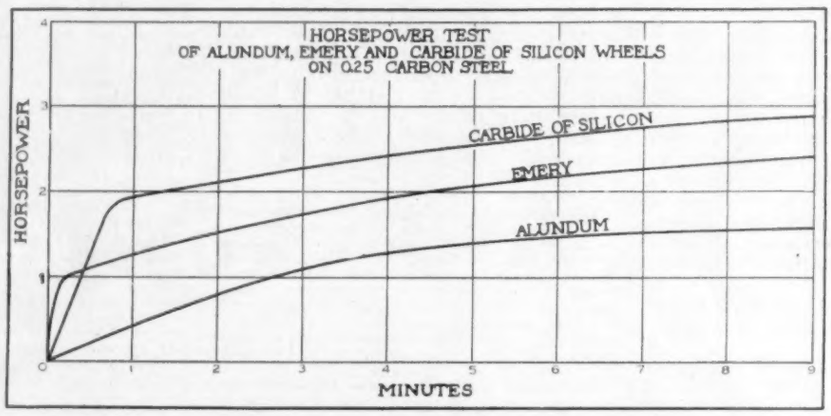


FIG. 1—HORSEPOWER TEST OF VARIOUS KINDS OF GRINDING WHEELS

Until a comparatively few years ago, little was known of different kinds of abrasives and still less of the characteristics of those most generally used, but greater accuracy together with more active competition and the lack of dependence that could be placed in natural products, either with respect to quantity or quality, made it necessary to seek a way out. The result is that today, by far the largest proportion of grinding wheels are made of artificial products which are controllable in quantity as well as quality.

We have come to recognize two principal groups of abrasive materials: (1) The aluminous group, which includes emery, corundum, alundum, aloxite and the like, and (2) the silicon carbide group, embracing crystolon, carborundum and products of a similar nature, which are manufactured abroad. The aluminous group is worthy of a little closer analysis. First, emery

Presented at the Chicago convention of the American Foundrymen's Association.

was the base of all grinding wheels. It is a product mined in Greece and Turkey, but not stable as to quality nor quantity. It is impure, carrying a high iron oxide content and rarely exceeding 60 to 65 per cent in crystalline aluminum oxide. It was quickly recognized that aluminum oxide content in crystalline form represented a direct measure of abrasive qualities, and a consequent effort was made to find a purer product.

The discovery of India, Carolina and Canadian corundum seemed to fulfill all the hopes in this respect and the materials themselves actually proved their value over emery because of the higher purity, running from 85 to 90 per cent in alumina. The supply, however, was found to be limited and attention was turned to the possibility of an artificial product with the result, that alundum was discovered in 1900, and since then has made for itself an enviable record. Alundum is the result of the fusion and simultaneous purification in electric arc furnaces, of the mineral bauxite, a hydrated oxide of alumina, mined for this express purpose in Arkansas. It is purer than either emery or corundum, much more uniform, dependable as a source of abrasive supply and has characteristics which the natural products lack. One of the principal advantages is that the artificial, aluminous abrasives may, by certain treatments during the process of manufacture, be given varying physical characteristics, such as toughness or temper. Thus, alundum is made tough for certain purposes, while also a material of greater brittleness, white alundum, is manufactured for operations where the work of grinding is delicate and particularly sensitive, requiring something more mellow in its action than is needed for snagging castings. The silicon carbide group does not, among its members, show the wide differentials in quality that the aluminous group does, since the production of this material is wholly dependent upon artificial processes and it must be manufactured under similar conditions with consequently similar results; the variations in the final product are more dependent upon the skill and knowledge of the wheel maker than upon inherent differences in the quality of the silicon carbide material itself. This product is the result of electrically heat-treating proper admixtures of coke and sand principally. Its characteristics are extreme hardness, probably harder than alundum, more nearly approaching the diamond, and of relatively extreme brittleness, easily breaking under shock in contrast to alundum, which with great hardness combined the characteristics of toughness.

We have then to consider the abrasive materials themselves as classified and, from purely the academic side of the problem, the artificial products are being recognized more and more as superior to the natural.

The first thought that a general classification of abrasives might be established as a guide to proper selection dependent upon the kind of material ground was obtained from competitive trials. An assimilation of this fact, however, was slow in coming, partly because of a lack of complete understanding and partly because no one manufacturer had a variety of abrasives suited to the different classes of metals and the perhaps quite natural tendency to cling to the old thought that an abrasive is an abrasive, and if good for one material should be equally so for all.

Later investigation has proved otherwise and disabused the minds of those directly connected with this work that different materials may require a quite different kind of abrasive when low cost is a factor to be considered.

It has been found that on all classes of steel from the poorer to the highest grade alloy steels, the aluminous abrasive, alundum, was far superior to emery, corundum or carbide of silicon, while on materials of a less tough nature, such as cast or chilled iron, brass, bronze, etc., silicon-carbide gave the better results. This leads to a general classification of materials and prompts one to seek the particular characteristic common to all which, varying quantitatively, might be the key to an understanding.

All the factors were eliminated as not directly bearing on the subject except tensile strength. This one physical characteristic permits of a general classification from which certain tenable conclusions may be drawn; however, it must be said that this rule, like others, has its marked exceptions. Hence a series of investigations was made which appear decidedly enlightening and seem to explain some points that had, heretofore, become accepted facts, but only vaguely understood.

Fig. 1 shows curves developed from tests made on a motor-driven cylindrical grinding machine equipped with all the necessary instruments to give the minutest data relative to power, speed, etc. The test was made on 0.25 per cent carbon machinery steel. An analysis of these curves shows that alundum is the most efficient abrasive for this work. The reason for alundum showing a higher efficiency in point of power consumption than emery is due to its greater degree of purity, while the fact that carbide of silicon, the hardest and sharpest abrasive, falls below either of the aluminous abrasives, may not be so easily understood. This is because of its decidedly different physical characteristics, it being thought that because of its comparative brittleness, the grain will not penetrate a metal of high tensile strength, but will break off.

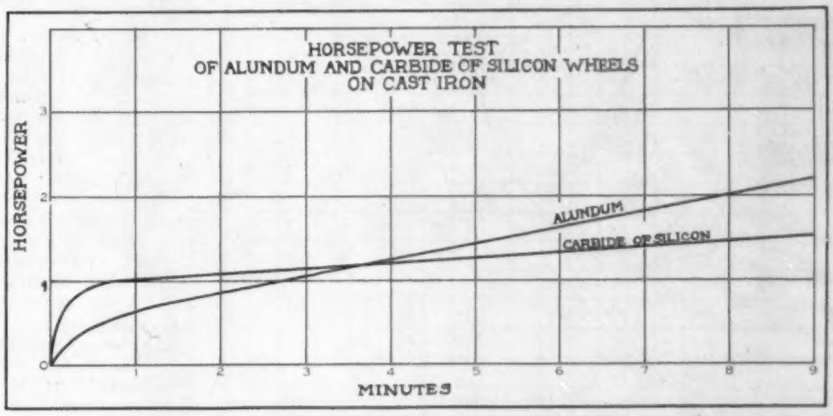


FIG. 2—HORSEPOWER TEST OF ALUNDUM AND CARBIDE OF SILICON WHEELS ON CAST IRON

The emery wheel, being composed of a somewhat softer cutting material, on account of the impurities in the grain, also loses its cutting teeth when grinding this tough steel, although not as quickly as carbide of silicon.

Fig. 2 shows the relative efficiency of alundum and carbide of silicon on cast iron.

Here the alundum wheel is superior to the carbide of silicon up to a certain period, but after passing this point the carbide of silicon becomes more effective. The explanation is that the carbide of silicon

grain is just tough enough to withstand the comparatively light work it has to do in cutting metals of low tensile strength. The grain of alundum, in this case, is perhaps a little too tough. It stands up until the grain is too dull, rubbing instead of cutting, requiring more power, and causing much heat which in turn converts the chips into globules.

Fig. 3 shows the relative efficiency of the abrasives in question and may be of assistance in determining the kind of abrasive to be used. It shows that carbide of silicon is most efficient on materials low in tensile strength, such as cast iron, phosphor bronze, brass, granite, etc., while alundum has its greatest efficiency on steel, malleable iron, etc.

The theory of classification on the basis of tensile strength seems well supported and the general similarity

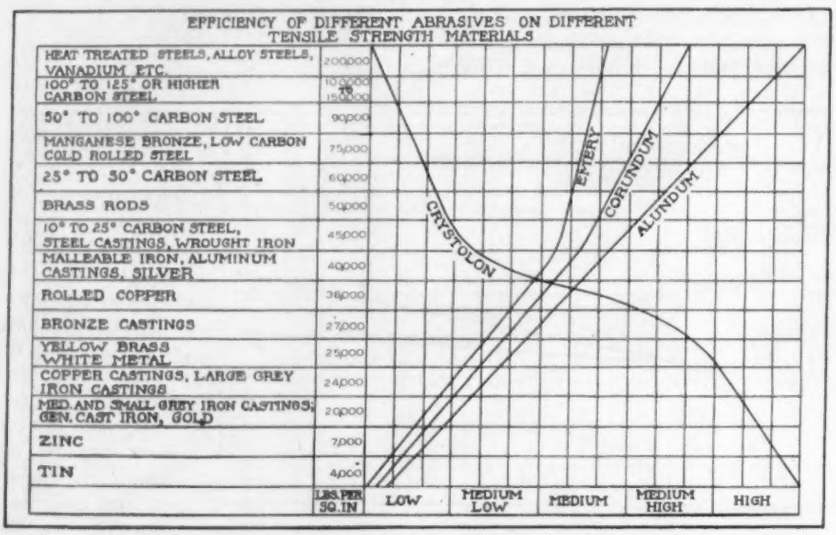


FIG. 3—EFFICIENCY OF VARIOUS ABRASIVES ON DIFFERENT MATERIALS

of the curves representing emery, corundum and alundum (ranged as one would expect them to be based upon their relative purities in aluminum oxide) is particularly noteworthy.

The entirely different characteristic of crystolon or silicon carbide is shown by the curve representing its work. At approximately 40,000 pounds tensile strength, the silicon carbide crosses the aluminous group curves. This corresponds with practical findings that on malleable iron it is often difficult if, indeed, not impossible to decide which is the better abrasive without a careful investigation being instituted. It is noteworthy also that on practically all materials other than metal, silicon carbide is the most effective; this includes granite, marble, concrete, horn, rubber, cork, leather, bone, pearl, etc.

In the selection of abrasive material for foundry snagging, therefore, a general guide (not infallible) may be found in the foregoing considerations. The selection of grain and grade is quite a different matter, however. We have to consider carefully that the life and productivity of a wheel made of a given abrasive material is directly measured by both the grain size and the strength with which the grains are held together. The latter factor is dependent upon the bond both in point of quantity and character.

The function of this bond is not only to hold the cutting particles of the wheel together and to give the wheel the proper factor of safety at the speed it is to be run, but it must also be possible to vary its strength to fit the work it is called upon to do. We often hear the operator say that the wheel is too hard or too soft. He means that the bond retains the cutting teeth so long that they become dulled, and this wheel is inefficient; or, in the case of a soft wheel, the bond is not strong enough to hold the cutting teeth and they are pulled out of the wheel before they have done the work expected.

The bond to be used for any given operation depends upon several factors:

1.—The wheel and work speeds should be considered, the latter in case the grinding is done by machine and not merely by hand application. The speed of the wheel has a most important bearing upon its action in point of hardness. A wheel traveling at 5,000 surface feet does not have the resistance that it would have if it were rotating at 6,000 surface feet, hence the consideration of the speed at which wheels are operated must of necessity influence the grade selection. The falling off in surface speed as the wheel wears down is also an important consideration and will be more fully discussed further on. If the work is mounted as in a cylindrical grinding machine or lathe or on the table of a boring mill, revolving against the cut of the wheel, the speed of the work obviously affects the lasting qualities of the wheel and generally it is a fact that as the higher the work speed, all other conditions being equal the harder must be the wheel.

2.—The condition of the machine, whether it be a floor stand, swing frame or flexible shaft machine, is important, since worn bearings, or an ill-fitting shaft, permit the wheel to jump and pound, thus breaking down the structure without effective work resulting. The rigidity of the machine has an equally important bearing since it is obvious that a light, springy structure may be as bad a wheel consumer as loose bearings in a massive construction.

3.—Contact is likewise a necessary consideration, since obviously sharp and narrow fins, sprues or gates have a natural dressing action and must be met with a correspondingly harder product, while if the contact is wide and comparatively smooth the wheel must be softer to permit of the cutting particles taking hold. If too hard a wheel under such conditions is used, it will soon be found that the cutting teeth get dull and glaze, the wheel requiring dressing which results, of course, in waste.

4. — The method of application, whether gentle or abusive, is a factor as well. In some cases heavy castings are swung against the wheel face with such force as to make the entire apparatus vibrate. Extremely hard wheels, under such conditions, are paramount, while with small, hand-applied castings, the gentler application requires a softer wheel to actually perform the work.

5.—The ability of the operator should be considered. Herein lies a very elusive factor, in that wherever the human element is introduced, variables must necessarily be concomitant therewith. It is not uncommon to find two operators, working side by side, under as nearly identical conditions as it is possible to produce, obtaining vastly different results in both output and life of the same grinding wheels, and they consistently continue to remain in the same relative positions unless the inferior worker is taught some of the very simple principles instinctively picked up by his neighbor.

Application of Work to Wheel

The method of applying castings, so that by the very work the wheel is performing, it is kept sharp and free-cutting, is a matter to which every grinding room foreman should give attention. Permitting a wheel to become dull and, consequently, require dressing, is wasteful, both in that valuable wheel material is thrown away and the operator's time lost. If the casting is such that no matter how it is applied, frequent dressing must be resorted to, it is a reasonably safe assumption that the wheel is not the proper one for the job.

In many instances in the case of both large and small castings, it has by education been possible to entirely discard the dresser, resulting in greater production and longer life for a given wheel. In many kinds of grinding a certain reasonable amount of dressing

is necessary just as a milling cutter requires sharpening in machine work, but in snagging work a combination of grain and grade should be used that will permit of a sharp wheel face being maintained without recourse to the wasteful dressing tool.

6.—Character of material, whether hard or soft, tough or brittle, goes hand-in-hand with the question of contact and determines both the grain size as well as the grade. In some materials it is necessary to experiment with both kinds of abrasives before the best is determined, while with others it is practically a foregone conclusion which kind will prove best. Generally, brittleness in abrasive material does not go with high tensile strength and hard irons call usually for the silicon carbide, whereas tough materials require the aluminous abrasive. Hard materials, if contact is wide and little dressing action takes place, will be best served with a wheel of somewhat softer grade than is required for tough steels. The various factors already described must be considered collectively and no definite rules can be set down to adhere to.

7.—The finish desired is practically a measure of the grain size necessary. For rough, heavy castings, where the essential feature is to remove the stock in the shortest possible time, and finish is secondary, an aggregation of coarse grains, each plowing out a comparatively heavy chip, may be used, while on the other hand small castings such as many machine parts, ornamental fixtures, or parts that are to be plated, must be provided with a fairly smooth surface requiring, in turn, grains of finer mesh, down to 24, 30 or 36, each of which manifestly cuts less deep than a 10, 12 or 14-mesh grain, leaving consequently shallower furrows in the finished surface.

Sight must not be lost of the fact that grain size has a certain influence on the action of a wheel with respect to its hardness or wearing qualities. Because of this, certain differentiations may be employed to overcome possible difficulties, by altering the grain size without necessarily altering the grade. For example, a 16-grade U wheel may be found a little too hard. It is feasible and practical in many instances to then change to a 14-grade U, which gives the wheel a slightly more open structure and under the same conditions will be found to act a little softer. Thus frequently advantage is taken of this fact and judicious substitutions often assist in bettering the conditions.

Mention has already been made of the influence of speed on both the cutting action and life of a wheel. It is worthy of a little deeper consideration.

At times it is reported that a wheel is below some other wheel in point of output and life, when an investigation may show that comparison has been made between wheels of different diameters, and while the revolutions per minute may be alike the peripheral speed is quite different. A maintenance of proper speed means much to the productive capabilities of a wheel.

An 18-inch wheel at 1,280 revolutions per minute moves with a peripheral speed of 6,000 feet. At 15 inches in diameter and the same revolutions per minute the surface speed is about 5,000, while at 12 inches it has dropped to 4,000.

The peripheral velocity at all times varies directly as the diameter under constant speeds. That is, the velocity at which the face of the wheel travels, when the number of revolutions per minute remains constant, grows less as the diameter decreases; hence, when the wheel is only five-sixths of its original size, the surface speed will be only five-sixths of that when the wheel was mounted, and when the diameter is down to two-thirds the original, the velocity of the surface will also be but two-thirds of the original. When a grinding wheel acts upon a piece of metal forced against its face, it is called upon to do work, or expend energy. This energy is supplied by the power given to the spindle and is taken up largely by the resistance the work offers to the abrasive particles acting as cutters on the face of the wheel. These particles cut loose a given piece of metal which leaves the point of contact at a line tangential to the wheel. At the same time, the resistance of the metal causes the abrasive particle to be worn down and broken off, or if the cutting edge of the particle in question has become very dull, the resistance of the metal may tear it out of its setting, exposing a fresh, sharp particle, which can do the work.

All this requires energy, which is stored in each particle of abrasive grain and capable of performing work. This energy factor is proportional to the square of the velocity with which the body travels, hence the power to do work falls off more rapidly than merely the difference between surface speeds at varying diameters. It is not so difficult then to understand why the complaint is frequently made that a wheel has diminished in productiveness toward the center and appears soft.

Consider Fig. 4. The cutting teeth when in contact with the work at *A* have a certain energy stored up in them, due to their mass and speed of travel. This energy is used in part to cut chips, and since this energy, as shown by the mathematical expression in the diagram, is proportional to the square of the velocity, it falls off as the diameters shrink to 15 and 12 inches in the proportions of 36 to 25 to 16. These latter figures represent the squares of the peripheral speed. In other words, when the diameter of the wheel has become 15 inches, the energy stored up in the cutting tooth is but 70 per cent of that at 18 inches, and when 12-inch diameter is reached, the energy is less than half of that at 18 inches, or only 44.5 per cent of the original.

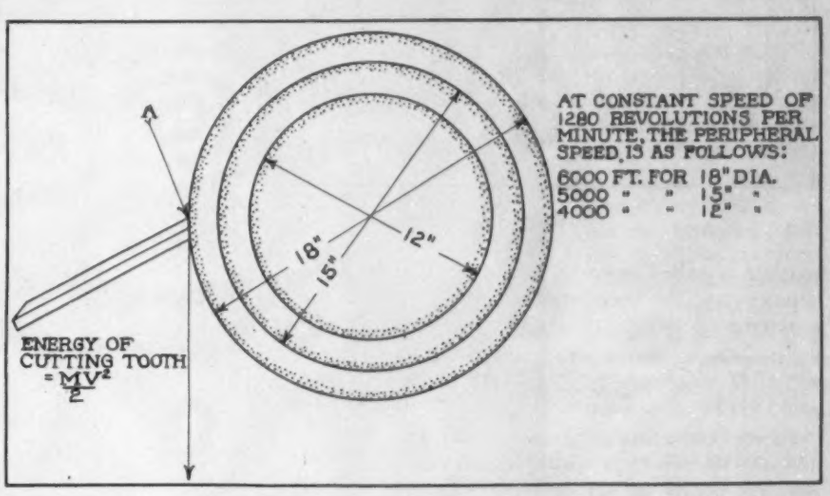

A
18"
15"
12"
AT CONSTANT SPEED OF 1280 REVOLUTIONS PER MINUTE, THE PERIPHERAL SPEED IS AS FOLLOWS:
6000 FT. FOR 18" DIA.
5000 " " 15" "
4000 " " 12" "
ENERGY OF CUTTING TOOTH = MV²/2

FIG. 4—DIAGRAM SHOWING VARIATIONS IN PERIPHERAL SPEED AND ENERGY

The grain has therefore less energy stored up within itself with which to meet the same resistance and the particles lose in cutting quality and are more readily torn bodily out of their setting. The wheel, therefore, loses in productive power as the speed of its cutting tooth is reduced, acting softer and forming the basis of complaints because of a lack of appreciation on the part of the user of the importance of speed. The logical method of meeting this difficulty is either to steadily increase the speed of rotation as the diameter wears, or from time to time to transfer wheels

to machines running at higher speeds. It must not be assumed, however, that the productive capacity of a wheel when worn down to 12 inches will be the same as at 18 inches, even if the peripheral speed is maintained constant. Manifestly, each cutting particle is called upon to act as much oftener as the revolutions are increased as follows:

Diameter.	Surface feet.	R. P. M.
18	6,000	1,280
15	6,000	1,520
12	6,000	1,920

Hence the cutting tooth, when at 12-inch diameter, is called upon to perform nearly 55 per cent more cuts if no greater wear is had. It is not likely that the grain will stand up to this, but it will approach it and the greater holding power of the bond at the higher speed will hold even a comparatively dull grain with sufficient tenacity to plow out a chip which might otherwise be met by a resistance sufficient to tear out the grain and leave the partial work to be completed by the next grain in contact.

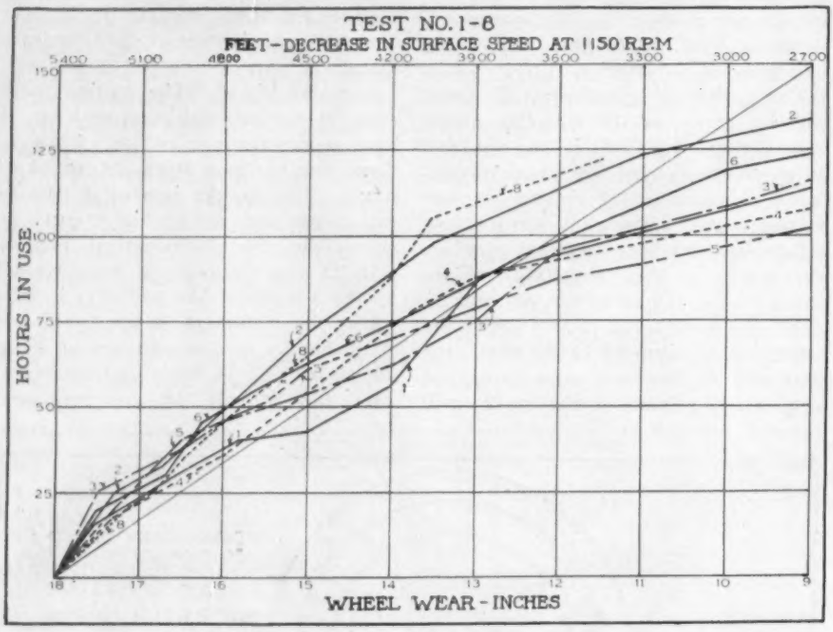


FIG. 5—WHEEL WEAR CURVES

Life of Wheel and Speed

The relation of life of wheel to speed is perhaps more clearly indicated in Fig. 5, representing the results of some tests recently reported upon.

These curves indicate the rate at which the life of the wheel decreases as the peripheral speed drops off. The continuous straight line is for a wheel lasting 150 hours in wearing uniformly from 18 to 9 inches in diameter. The surface speed to start was 5,400 feet and revolutions per minute being maintained constant the surface feet dropped to 2,700 feet at 9 inches diameter. At 5,400 surface feet and full diameter the wheels start off at a 200 to 250-hour pace, but the effect of a falling off in speed is almost immediately detected and instead of obtaining even 200 hours of wheel life, the ultimate result is considerably less than 150. Had these wheels been speeded up again at 15-inch diameter and 12-inch, they undoubtedly would have shown more nearly straight lines and their life proportionately increased. The inclination of the lines to the horizontal measures directly the rapidity of wear and the more acute this angle, the more rapid the loss of wheel diameter.

Increased production is unquestionably to be expected from an increase in speed, because of, first, the greater energy and consequent cutting ability of the grain particles; second, the more frequent cuts of each grain per unit of time; and third, the harder action of the wheel, or better, the greater holding power of the bond. It must be borne in mind, however, that a wheel selected to do a certain piece of work at say 5,000 initial surface feet, will not, if already at the limit of hardness, necessarily operate satisfactorily at 6,000 surface feet per minute. A change in grain and grade combination may be necessary and the higher speeds should be employed only when the machines are in good condition, and provided with proper protection hoods.

The results of these plottings clearly indicate that a wheel should, in so far as is practical, be maintained at a uniform surface speed, either by variable speed motor control, cone pulley shift, or as is now being done in many shops, transferring the wheel from one stand to another every two or three inches of its wear. Thus, periodically a higher number of revolutions are provided to bring the surface speed back to practically that at which the new wheel started. This will be found to bring about a condition of economy little appreciated by those who have not had occasion to try it.

Uses of Grinding Wheels

It would not be practicable to outline the many hundreds of operations for which grinding wheels are required, but the accompanying table may serve as a guide and has been prepared on the basis of wide general experience with wheels made of alundum and crystolon. Within the ranges given it is likely that a satisfactory combination of abrasive, grain and grade for any given grinding operations will be found.

From this table it will be noted that the aluminous abrasive is generally specified for the high tensile strength material while crystolon is set against the low. To this, however, as well as other rules, exceptions are to be recorded. For example, while malleable iron is given as an aluminous abrasive material, the unannealed product is generally found to be better served by the more brittle, silicon carbide abrasive. Aluminum is an-

TABLE SHOWING ABRASIVES ADAPTED TO DIFFERENT CLASSES OF WORK

Kind of Work.	Grain.	Abrasive.	Grade.
Large Steel Castings	10 to 14	Alun. Vit.	S and harder
Small Steel Castings	20 to 30	Alun. Vit.	P to S
Large Mall. Iron Castings	14 to 20	Alun. Vit.	Q to U
Small Mall. Iron Castings	20 to 30	Alun. Vit.	P to S
Large Cast Iron Castings	16 to 24	Crys. Vit.	O to U
Small Cast Iron Castings	24 to 36	Crys. Vit.	P to U
For Machining Alloy Steel Castings on Lathe, Boring Mill and Shaper Types of Machines	14 to 20	Alun. Vit.	M to Q
Brass and Bronze Castings	24 to 36	Crys. Vit.	O to Q
Aluminum Castings	30 to 36	Alun. Crys. Elas.	4 to 5

(*Continued on page 332b*)

Use of Electricity in Melting Brass

An Account of Some Interesting Tests Made by the National Cash Register Co.

BY DR. HERBERT G. DORSEY

ALTHOUGH no brass foundries are melting their product electrically at the present time on a commercial scale, yet it seems probable that within a few months several companies will be nearing the solution of this problem. Electric furnaces have been applied successfully to the steel industries for many years, but little attention has been paid to electric furnaces for brass melting until the last two or three years. Since induction furnaces and arc furnaces have been successful in the steel industry, it was natural that they should also be tried for brass melting. The induction furnace of the ordinary horizontal ring type soon proved to be impracticable for melting any of the metals or alloys of high conductivity, such as aluminum, copper, or brass. The heat generated being proportional to the resistance multiplied by the square of the current, if the resistance of the bath of metal is very low, the current itself must be enormously great in order that the necessary amount of heat may be generated. But the pinch effect, or squeezing together of a current carrying liquid conductor, also depends upon the square of the current and for such high currents the pinch effect actually opens the circuit if used on any of these three metals. For this reason, this type of induction furnace was soon eliminated from the field of brass melting.

Some advocated the arc furnace, but as the results which had been obtained by this method did not look very favorable, it seemed best for The National Cash Register Co. to try out some of the resistance types of furnaces.

A search through the literature showed only one advertisement of an electric furnace which was claimed would melt brass. This was the Helberger type furnace made by the Allgemeine Elektricitats Gesellschaft of Germany, which advertised furnaces up to 100 kilograms capacity, and their largest type furnace was ordered in August, 1912.

Little real information could be learned about the details of this size furnace, although some of the smaller furnaces had been previously described in various places. The furnace is outlined in Helberger United States patents No. 932,986, and No. 1,023,309, and some of the details are described in German patents. Apparently this large size furnace has been developed from a small size suitable for dentist and jewelry work. The development, however, does not seem to have been accompanied by practical experience for it seems that a small furnace of this type might be worked successfully.

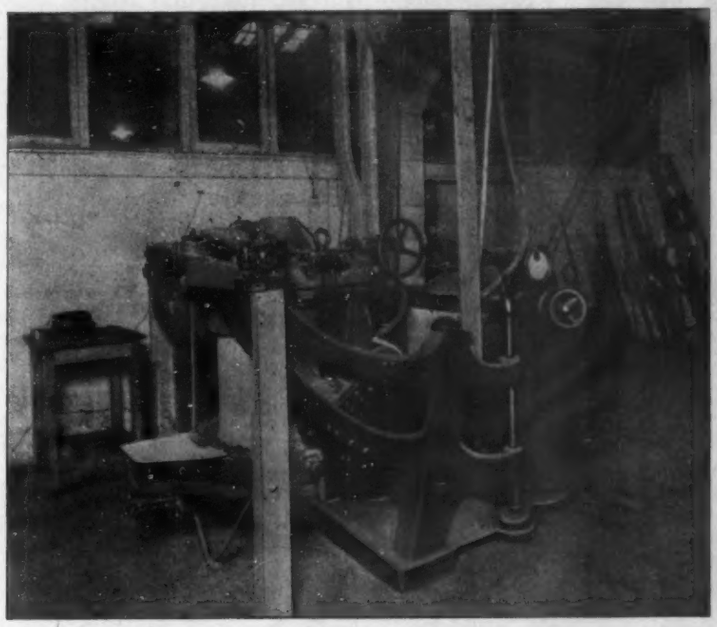


FIG. 1—HELBERGER ELECTRIC FURNACE

After a year and a half of waiting, the furnace was received and a still further delay was encountered because no tilting device had been provided with the furnace.

Although the makers' advertising literature showed a tilting device, none was received and a cablegram to the makers brought the reply that none was furnished with the furnace. A tilting device was made so that the furnace could be operated by hand, the larger part of the weight being counterbalanced. As received, the furnace consists essentially of two parts, a 100 kilowatt transformer to convert 440 volt single phase, 60 cycle alternating current down to various voltages from 6 to 12, and the furnace proper. The secondary of the transformer is water cooled and the current is carried by means of thin strips of copper to two water-cooled copper blocks on either side of the furnace. Sliding copper brushes make contact with these blocks and heavy copper strips carry the current to the top and bottom of the furnace. Fig. 1 shows the furnace when ready for operation. At the right may be seen the transformer and at the left the furnace proper. Fig. 2 shows a cross-section of the furnace, which consists of the resistor *I*, made of carbon and resting on a carbon block *B*. The resistor is 30 inches high, 11 inches in diameter at the bottom, and 13 inches at the top. The conductivity of the resistor and top and bottom plates is about the same as that of ordinary electric light carbon. Around this resistor is a magnesite filling *F*, which is retained by the fire clay cylinder *G*, and the latter is wrapped with asbestos rope *D*. Above the resistor is a carbon ring *A*, which serves to keep the resistor in place and also supply an electrical connection.

Current from the sliding brushes is carried to the cast iron rings *R* at the top and bottom of the furnace which are water-cooled by means of annular openings *S*, contact being made between the carbon rings *A* and *B* by means of wedges *W*. As the furnace was originally received, these wedges were graphite, although an extra set made of cast iron were sent with the furnace. There seemed to be no difference in the operation whichever material was used. The upper carbon ring *A*, the lower carbon plate *B*, and

Paper presented at the Chicago meeting of the American Institute of Metals.

the resistor are all held together by means of three long bolts fixed with screws and nuts geared together so that the adjustment of clamping may be changed if necessary. Inside of the resistor *I* and fitting it snugly is a crucible *C* made of a composition of low electrical conductivity, sort of a carbon clay mixture somewhat similar to a regular foundry crucible material. At the top of the furnace is a pouring spout *X* made of perforated sheet iron covered on either side with a mixture of graphite and fire clay. The shape of this spout makes it difficult to close the crucible.

The furnace part is supported on trunnions in such a manner that it may be tilted, having the axis of rotation through the lip of the furnace so that when metal is poured, it may be poured directly into molds. The trunnion supports were so weak that it was necessary to brace them to prevent lateral motion. The heat of the furnace is generated in the carbon resistor, already described, and must travel through the walls of the crucible before it can reach the metal to be melted. The crucible itself must be a very poor conductor of electricity even when hot, otherwise the current would pass through the metal, the latter being such a good conductor of electricity compared with the resistor that little heat would be generated unless enromous currents were used.

The transformer is provided with a switch leading to different taps of the primary so that six different voltages may be applied to the resistor. The following table shows the ratios of the primary voltage, amperage and kilowatts, the measured voltage of the secondary and the computed current flowing through the resistor, assuming 96 per cent transformer efficiency:

	Primary.			Secondary.	
	Volt-age.	Am-perage.	K. W.	Volt-age.	Am-perage.
First	462	65	30	6.6	4450
Second	455	79	36	7.2	4660
Third	458	96	44	8.0	5280
Fourth	447	123	55	8.9	5940
Fifth	437	160	70	10.1	6660
Sixth	422	218	92	11.5	7680

Current was first turned into the Helberger furnace on Jan. 14, and the furnace warmed up a little bit each day until Jan. 17, when it was brought up to a temperature of 1,275 degrees Cent. Then a number of melts were taken as shown in the following table:

Date.	Heat No.	Time.	Amt. of metal lbs.	Temp. Cent.	K. W. H.	K. W. H. per cwt.
1-17-14	1	64 min.	121.5	1330	85	70
1-17-14	2	33 min.	120	1325	51	42
1-19-14	3	81 min.	200	1250	111	50.5
1-19-14	4	48 min.	200	1300	76.5	38
1-19-14	5	41 min.	200	1380	65.5	33
1-20-14	6	70 min.	200	1260	108.5	54

During the sixth run, the current fluctuated considerably when the metal was stirred and the circuit breaker was thrown out twice indicating current upwards of 300 amperes. Carbon monoxide flames were seen rising around the upper part of the crucible. On pouring the metal it continued to run out after the crucible part was apparently empty, just as though the crucible had been punctured and metal had run in between the crucible and resistor. On removing the crucible the next day, breaking it to pieces to get it out, a plate of whitish-colored metal about ⅛ inch thick was found between the bottom of the crucible and the resistor. On analysis this metal showed silicon and aluminum which were not present in the "C" metal which had been melted.

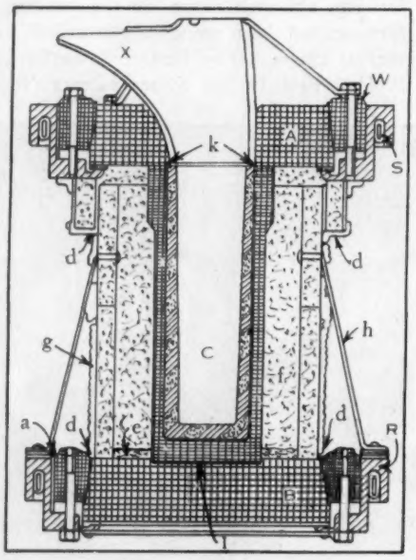


FIG. 2—VERTICAL CROSS SECTION OF ELECTRIC FURNACE

A new carbon crucible was inserted and melting was continued as follows:

Date.	Heat No.	Time.	Amt. of metal lbs.	Temp. Cent.	K. W. H.	K. W. H. per cwt. day av.
2- 3-14	9	42 min.	150	1270	52	..
2- 3-14	10	40 min.	150	1270	48	..
2- 3-14	11	37 min.	150	1270	43	..
2- 3-14	12	29 min.	150	1270	24	..
2- 3-14	13	55 min.	170	1270	56	..
2- 3-14	14	60 min.	200	1200	39	27
2- 4-14	15	143 min.	150	1200	120	..
2- 4-14	16	49 min.	150	1270	55	..
2- 4-14	17	40 min.	150	1200	51	..
2- 4-14	18	30 min.	150	1200	39	..
2- 4-14	19	32 min.	150	1200	50	..
2- 4-14	20	30 min.	180	1270	42	..
2- 4-14	21	42 min.	165	1200	40	..
2- 4-14	22	34 min.	150	1270	55	..
2- 4-14	23	31 min.	150	1200	50	..
2- 4-14	24	36 min.	150	1200	48	35.6
2- 5-14	25	132 min.	150	1170	128	..
2- 5-14	26	42 min.	175	1200	64	..
2- 5-14	27	44 min.	150	1170	43	..
2- 5-14	28	56 min.	150	1170	45	44.8

The crucible having worn thin and cracked through, a crucible was molded in place around a core of wood. A mixture of two parts carborundum and one part fire clay was very slightly moistened and rammed into place until it appeared homogeneous. After drying slowly and thoroughly, heats No. 29 and No. 30 were successfully made, as shown in the following table:

Date.	Heat No.	Time.	Amt. of metal lbs.	Temp. Cent.	K. W. H.	K. W. H. per cwt. day av.
2-16-14	29	234 min.	150	1175	160	..
2-16-14	30	53 min.	175	1135	67	70
2-16-14	31	Metal froze				

This freezing of the metal was caused by poor contact between the upper carbon plate and the wedges which carried the current from the circular metallic conductor to the carbon plate. The molded crucible was then removed and a new crucible, new resistor and new top plate, all from the makers, were installed and eighteen successive heats made as follows:

Date.	Heat No.	Time.	Amt. of metal lbs.	Temp. Cent.	K. W. H.	K. W. H. per cwt. day av.
2-23-14	32	159 min.	150	1175	139	..
2-23-14	33	40 min.	150	1200	67	..
2-23-14	34	32 min.	150	1175	56	..
2-23-14	35	41 min.	150	1175	50	..
2-23-14	36	30 min.	150	1200	46	..
2-23-14	37	93 min.	150	1175	44	..
2-23-14	38	44 min.	175	1175	80	..
2-23-14	39	22 min.	150	1240	51	..
2-23-14	40	20 min.	150	1200	38	41.5
2-24-14	41	154 min.	150	1175	175	..
2-24-14	42	40 min.	150	1200	67	..
2-24-14	43	32 min.	155	1175	62	..
2-24-14	44	30 min.	150	1240	60	..
2-24-14	45	31 min.	150	1175	33	..
2-24-14	46	70 min.	150	1175	28	..
2-24-14	47	37 min.	170	1240	72	..
2-24-14	48	32 min.	170	1175	51	..
2-24-14	49	30 min.	156	1200	45	42.2

At this time the crucible wore out and another crucible was made of carborundum sand and fire clay and six heats were obtained as follows:

Date.	Heat No.	Time.	Amt. of metal lbs.	Temp. Cent.	K. W. H.	K. W. H. per cwt. day av.
2-26-14	50	70 min.	150	1175	106	..
2-26-14	51	45 min.	150	1175	65	57
2-27-14	52	127 min.	150	1175	193	..
2-27-14	53	55 min.	165	1230	70	..
2-27-14	54	42 min.	170	1175	69	..
2-27-14	55	40 min.	162	1175	53	58.5

The last of these heats indicated foreign matter in which the metal and an analysis showed it to contain silicon and aluminum. When the furnace was again dismantled a whitish metal was found in the bottom, which contained 5.22 per cent silicon, 0.42 per cent iron, and 0.70 per cent aluminum, none of which were present in the alloy being melted.

Suitable for Laboratory Purposes

Considered commercially, from our standpoint this furnace is a failure. It shows many disadvantages and very few advantages. As a laboratory furnace, including experimental work in the foundry on new combinations, it possibly is a good type of furnace, provided a suitable crucible can be obtained, because almost any temperature may be reached and easily maintained for any considerable length of time, and if only a few heats were to be made per week, the occasional renewing of crucible, resistor, plates, etc., would not be bother-

(*Continued on page 332c*)

Blast Furnace Tapping Machine

Description of a Mechanical Device for Tapping, Which is in Successful Operation at Youngstown Furnaces

UNTIL a few years ago blast furnaces were small and blast pressures light. A large force of men was required to prepare the sand beds and handle the iron. At that time little attention was given to improving the methods of tapping the furnace for releasing the molten iron, as there was plenty of labor to draw on. With the introduction of machinery for filling the furnace and handling the product more rapidly, there was a proportional reduction in the need for hand labor. This necessitated a change in the method of tapping the furnaces, which had greatly increased in size while the blast pressure had been more than doubled.

To meet the new conditions, twist drills, operated by compressed air or electricity, are sometimes used to replace the men formerly employed in getting the first or soft part of the holes with a churn drill, as shown in Fig. 2. Difficulties are sometimes encountered when drilling a hard hot or cold hole with a twist drill and it is usually supplemented by a churn drill. To complete the tapping a pointed bar is then driven by sledges. If the hole is particularly hard and hot, the bar will turn up at the end and must be withdrawn and replaced, several bars sometimes being required to get the iron. This work is laborious and exhausting, even in cold weather, and the vitality of the men is greatly reduced at a period when activity and alertness is most required of them, for flowing molten iron is no respecter of persons when out of control. Occasionally, the hole cannot be opened after long and tiresome effort and another is started and continued in the same way as the first, several hours frequently being required before reaching the iron. Following a failure to get the hole with the bar, oxygen is sometimes employed.

Oxygen is highly efficient for a hole composed of iron alone. Sometimes, however, in the absence of iron, a hard hole is not amenable to the influence of oxygen, and only an efficient mechanical device can penetrate to the point where the oxygen can be brought into use, or even to the molten iron itself.

This practice requires the presence of the men in front of the furnace where accidents most frequently occur as, at the moment of releasing the iron, the high pressure forces it out in the form of incandescent shot with great speed. Even with protecting shields in use, the shower of hot iron sometimes finds its way between and over all barriers, to the fleeing men.

The need for a more efficient method of tapping a furnace has long been apparent to furnacemen. The Mullen tapping machine, shown in the accompanying illustrations, is a device which combines a high degree of efficiency with absolute safety to the men. In Fig. 1, it is shown in operation at "C" furnace of the Youngstown Sheet & Tube Co., Youngstown, O. In the right background, at a considerable distance from the furnace, is seen the only man required for tapping this furnace. He is operating the machine from the switchboard and air valve, outside the danger zone, while the other men are at work at their respective stations, or at some point of safety, awaiting the iron which the machine will start flowing in four to seven minutes, according to the length of the hole.

The machine is also shown in Fig. 3 with the protecting cover raised on one side, disclosing the cylinder, the telescopic air connections, the cross head in which the drill turning mech-

FIG. 1—MULLEN TAPPING MACHINE IN OPERATION

FIG. 2—TAPPING FURNACE WITH CHURN DRILL

anism is located, the drill chuck and the drill. At the back end is the feeding mechanism which is concealed from view.

At the moment of getting the iron, the machine is quickly drawn away by an electric crane, jib crane or trolley, according to local conditions. Fig. 4 shows a different model of the Mullen machine, at the Haselton furnace plant of the Republic Iron & Steel Co., Youngstown, swinging on a jib crane.

The drill is advanced under normal conditions at the rate of one foot per minute. If desired, the iron may be reached with the drill instead of employing the present method of driving and drawing the tamping bar. In the former case, a low cost steel is used, making it no more expensive than burning a tapping bar. In actual practice with this machine, it has been demonstrated that with ordinary care, a drill may be used several times to get the iron without being burned. This eliminates one more operation in tapping the furnace with the additional advantage of maintaining a hole at a uniform diameter throughout its entire length. This feature taken in connection with a hole always made at the same angle, affords a smooth, even run of iron without the use of pricking bars, an item of economy of considerable importance. The force and rapidity of the blows delivered by this machine is greatly in excess of that possible from manual manipulation, consequently holes impossible of attainment by hand are readily gotten by this machine. A hollow drill may be used to keep the hole clear, the air being introduced into the drill through the driving spindle and chuck. The working parts of the machine are enclosed in a cast iron housing.

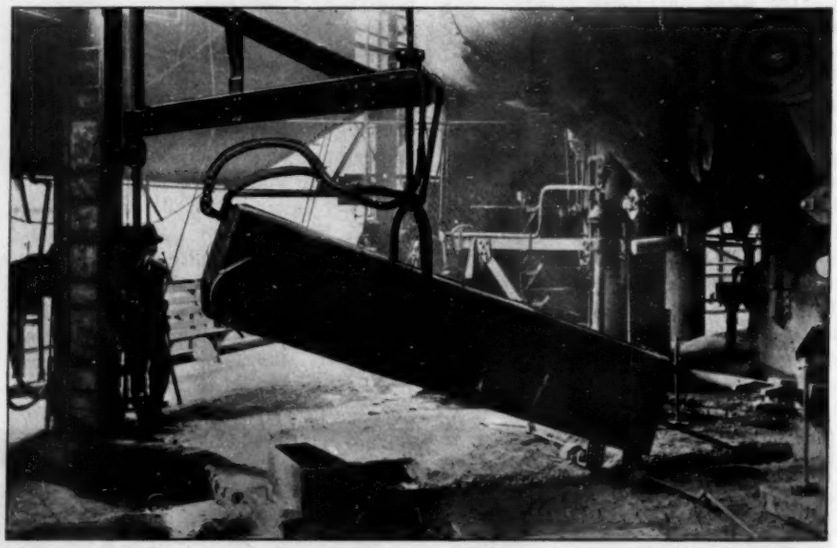


FIG. 4—TAPPING MACHINE SWINGING ON JIB CRANE

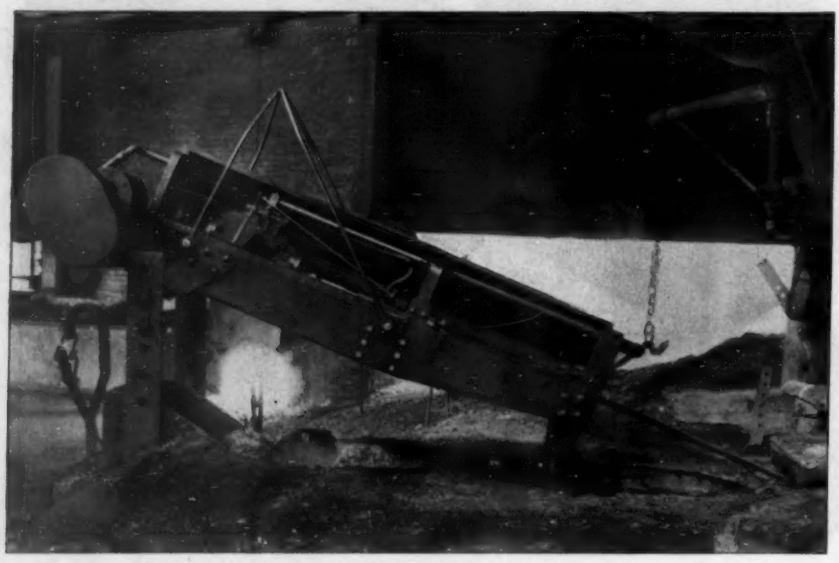


FIG. 3—PROTECTING COVER RAISED SHOWING OPERATING MECHANISM

The reciprocating motion of the drill is produced by a cylinder mounted on guides cast with and forming part of the housing. Air or steam may be used. A cross head is attached to the piston rod of the cylinder and travels on the same guides as the cylinder. The cross head is in two parts, a vanadium steel driving spindle being inserted and bolted between these parts. Attached to the driving spindle is a ratchet wheel for rotating the drill, the ratchet wheel being operated by a pawl and lever. The lower end of this lever travels back and forth with the cross head in a trough set at an angle with the travel of the cross head to give the proper turning motion to the spindle. Attached to the driving spindle is a quick-acting chuck for the speedy insertion and removal of the drill. The blow of a hammer

on the wedge either fastens or releases the drill as may be required. In case it is desired to drive a bar, a driving head is inserted in the chuck in the same manner as the drill. To draw the bar, a yoke, attached to the crosshead, is always in position for this purpose. It is designed so that it forms a guide for the drill and accurately holds the bar in alignment for either driving or drawing. Both of these operations are performed by the same reciprocating motion employed in drilling.

A stationary, electrically-driven screw, passing through a boss cast on the cylinder, to a thrust bearing, advances the cylinder at the proper speed for feeding when drilling and is geared for high speed backward when the iron is tapped. A dial and indicator is attached to the machine, in plain view of the operator at the switchboard and valves, which aids in controlling the operation. The means for feeding the drill by hand from a safe distance is provided in case of emergency.

The machine has passed the experimental stages, and the result is a machine which is simple both in its mechanism and operation. B. J. Mullen, Youngstown, is the inventor, and John Ruddiman, 229 Front street, New York City, is the selling agent.

Course in Management

The summer course in scientific management for practical men employed in the industries, to be given Aug. 14-28 at the Pennsylvania State College by Prof. Hugo Diemer and W. H. Tabor, will be limited to 20 students. Work will begin at 9 a. m. Aug. 16. This course is open to any person employed as superintendent, foreman, head of cost store, or production department or in similar positions. Inquiries should be addressed to Prof. J. A. Moyer, engineering extension division, Pennsylvania State College, Pa.

Will Double Capacity

The Valley Mould & Iron Co., Sharpsville, Pa., is beginning to make extensive enlargements to its Sharpsville foundry that virtually will double its capacity. President George H. Boyd says:

"In order to safeguard our customers, it is essential to have a large surplus capacity to meet unexpected demand for molds, and the present increase while perhaps unnecessarily extensive for the purpose, is primarily to provide surplus capacity over present needs. We hope to have this extension completed in about four months."

Building Plans

Of United Steel Co., Canton, Include Large Mill Additions

The United Steel Co., Canton, O. has announced a huge building program in addition to the blast furnace project which it has undertaken in connection with Pickands, Mather & Co., as well as the expenditure of $1,000,000 now going on in its present mill plant. The additional plan calls for the building of a structure that will contain eventually 12 open hearth furnaces, thus giving the works finally a total of 20 open hearths. Five of the proposed furnaces will be built at once, and thus the works will have 13 open hearth furnaces each of 75 tons capacity. A 36-inch blooming mill will be installed, with a capacity of 40,000 tons a month, and sheet bar mills of like capacity.

Contracts as yet have not been placed for the blooming and sheet bar mills, but will be soon.

Steel Work

For Canton Furnace Awarded—Rebuilding Thomas Stack

Contract for the iron and steel work on the blast furnace proposed by the United Furnace Co., for Canton, O., has been closed with the Variety Iron Works Co., Cleveland. The Canton furnace is projected by interests identified with Pickands, Mather & Co., of Cleveland; and with the United Steel Co. The by-product coke ovens for the Canton plant have been awarded H. Koppers Co. No other contracts have been given out as yet in connection with the Canton furnace, for which Julian Kennedy is drawing plans. Construction will proceed during the autumn and winter.

The Thomas Iron Co., Easton, Pa., has given contract for rebuilding its No. 7 blast furnace to Arthur G. McKee & Co., Cleveland. The remodeled No. 8 stack has done such satisfactory work that the company proposes to rebuild No. 7 stack along the same lines, although it will put a small steel shell inside the old stone stack.

Orders for Mesta Pickling Machines

The Mesta Machine Co., Pittsburgh, has just shipped a four-arm low type pickling machine to the Alan Wood Iron & Steel Co., Philadelphia. This machine is of the improved type with the balancing cylinder described in one of the Mesta company's former issues. Another four-arm low type machine has been shipped recently to one of the largest arms manufacturing companies in the United States. It is to be used for pickling rifle barrels, gun parts and small castings and is the second unit of the type furnished to this company within the last year. It is said that the machine is pickling as much material in 15 minutes as could be pickled by the old method in from three to five hours. Furthermore, the material is much more thoroughly cleaned, thus eliminating the necessity of the sand blast previously required to insure a clean product.

Two machines of the standard low type are now being built for the Standard Tin Plate Co., Cannonsburg, Pa., which has had two Mesta pickling units in operation for a number of years. Orders have just been received from the McKeesport Tin Plate Co. for three additional low type pickling machines for its new plant at McKeesport. When these new units are installed this company will have a total of six Mesta pickling machines in its plant, three having been in operation for several years. The steady demand and the continuance of repeat orders for this machine indicate that its use gives entirely satisfactory results. Furthermore, a thoroughly pickled product is obtained. Hundreds of these machines are now in operation throughout the United States, pickling sheets, pipe, strip steel, gun parts, automobile parts, wire coils, castings and various other products of iron, steel, brass and copper.

Complete Building

The main building at the new plant of the Chattanooga Stamping & Enameling Co., Chattanooga, Tenn., has been completed. It is 100 x 300 feet. Rapid progress is being made in installing the enameling ovens. This building is the first manufacturing plant in Chattanooga to be floored with wood block. The gases from the enameling ovens will be conveyed through underground conduits to the boiler room and consumed as fuel. The stamping machinery is now being installed and the company expects shortly to engage in the manufacture of stove parts, metal queensware and railroad semaphores.

Asks for Catalogs.—Elie N. Caralopoulos, Rue Minerve 9, Athens, Greece, a firm dealing in iron and steel products, particularly tubes, sheets, rivets, axles and carriage supplies, wishes to receive catalogs for all articles of this kind from American manufacturers with price lists and terms for export. Mr. Caralopoulos gives all the banks of Athens as reference as to the solvency of his firm.

Production of Pig Iron in the United States in First Half of 1915

(Statistics compiled by American Iron and Steel Institute)

HALF-YEARLY OUTPUT OF PIG IRON BY STATES.

HALF-YEARLY PRODUCTION OF ALL KINDS OF PIG IRON.

States.	Blast furnaces. In blast Dec. 31, 1914.	Blast furnaces. June 30, 1915. In.	Out.	Total.	Production—Gross tons. (Includes spiegeleisen, ferro-mang., ferro-silicon, ferro-phosphorus, etc.) First half of 1914.	Second half of 1914.	First half of 1915.
Massachusetts	1	0	2	2	4,292	2,302	3,087
Connecticut	1	1	2	3			
New York	12	16	11	27	818,425	741,439	921,566
New Jersey	1	1	4	5			
Pennsylvania	63	96	62	158	5,207,051	4,526,318	5,199,421
Maryland	2	2	3	5	101,605	93,989	85,673
Virginia	3	5	17	22	164,796	106,432	105,244
Georgia	0	0	4	4	.....	.....	.....
Texas	0	0	2	2			
Alabama	18	20	28	48	902,186	924,743	868,341
West Virginia	1	1	3	4	136,742	99,651	79,228
Kentucky	1	1	5	6			
Mississippi	0	0	1	1			
Tennessee	4	5	13	18	113,137	103,601	82,992
Ohio	31	50	24	74	2,865,367	2,418,059	2,964,211
Illinois	7	12	14	26	1,045,905	801,546	801,951
Indiana	4	10	0	10	851,700	705,655	854,375
Michigan	9	8	6	14			
Wisconsin	3	4	4	8	195,991	133,535	130,514
Minnesota	0	1	0	1			
Missouri	1	1	1	2			
Colorado	2	2	4	6	128,897	138,880	137,188
Oregon	0	0	1	1			
Washington	0	0	1	1			
California	0	0	0	0			
Total	164	236	212	448	12,536,094	10,796,150	12,233,791

HALF-YEARLY PRODUCTION OF COKE PIG IRON.

New York	12	16	7	23	818,425	741,427	921,566
New Jersey	1	1	4	5			
Pennsylvania	58	91	44	135	5,147,691	4,490,988	5,155,120
Maryland	1	2	2	4	101,605	93,739	85,578
Virginia	3	5	15	20	163,330	104,429	105,244
Georgia	0	0	2	2			
Texas	0	0	1	1			
Alabama	16	18	26	44	893,867	912,904	853,445
West Virginia	1	1	3	4	136,617	99,634	79,228
Kentucky	1	1	4	5			
Tennessee	4	5	12	17	113,137	101,527	82,992
Ohio	30	49	24	73	2,865,267	2,416,981	2,964,007
Illinois	7	12	14	26	1,045,905	801,546	801,951
Indiana	4	10	0	10	890,814	728,740	851,084
Michigan	2	2	1	3			
Wisconsin	2	3	3	6			
Minnesota	0	1	0	1			
Missouri	0	0	1	1			
Colorado	2	2	4	6	158,162	150,121	161,593
Washington	0	0	1	1			
California	0	0	0	0			
Total	144	219	168	387	12,334,820	10,642,036	12,061,808

ANTHRACITE AND MIXED ANTHRACITE AND COKE PIG IRON.

New York	0	0	3	3	57,507	33,957	42,487
Pennsylvania	3	2	15	17			
Total	3	2	18	20	57,507	33,957	42,487

HALF-YEARLY PRODUCTION OF CHARCOAL PIG IRON.

Massachusetts	1	0	2	2	4,292	2,314	3,087
Connecticut	1	1	2	3			
New York	0	0	1	1			
New Jersey	0	0	0	0			
Pennsylvania	2	3	3	6	1,853	1,373	1,814
Maryland	1	0	1	1	1,466	2,253	95
Virginia	0	0	2	2			
Alabama	2	2	2	4	8,319	11,839	14,896
Georgia	0	0	2	2			
Texas	0	0	1	1			
Kentucky	0	0	1	1	225	3,169	204
Tennessee	0	0	1	1			
Mississippi	0	0	1	1			
Ohio	1	1	0	1			
Michigan	7	6	5	11	106,203	88,496	98,856
Wisconsin	1	1	1	2			
Missouri	1	1	0	1	21,409	10,713	10,544
Oregon	0	0	1	1			
California	0	0	0	0			
Total	17	15	26	41	143,767	120,157	129,496

TOTAL PRODUCTION OF PIG IRON ACCORDING TO FUEL USED.

Coke	144	219	168	387	12,334,820	10,642,036	12,061,808
Anthracite*	3	2	18	20	57,507	33,957	42,487
Charcoal	17	15	26	41	143,767	120,157	129,496
Total	164	236	212	448	12,536,094	10,796,150	12,233,791

* Includes mixed anthracite and coke pig iron.

HALF-YEARLY OUTPUT OF PIG IRON BY GRADES.

HALF-YEARLY PRODUCTION OF BASIC PIG IRON.

States.	First half of 1914.	Second half of 1914.	First half of 1915.
New York, New Jersey	153,112	236,075	248,725
Pennsylvania—Allegheny County	1,326,364	1,293,261	1,468,844
" Other counties	1,346,789	1,300,390	1,421,826
Virginia, Alabama	295,283	247,869	315,133
Ohio	798,505	709,768	841,226
Indiana, Illinois	942,104	737,064	809,005
Michigan, Missouri, Colorado	148,490	135,613	154,855
Total	5,010,647	4,660,040	5,259,614

HALF-YEARLY PRODUCTION OF BESSEMER AND LOW-PHOSPHORUS.

New York	170,854	78,148	170,149
Pennsylvania	1,880,451	1,422,803	1,749,755
Maryland	101,605	93,739	73,449
West Virginia, Kentucky, Tennessee	112,339	69,697	70,214
Ohio	1,551,795	1,353,670	1,661,516
Illinois	561,054	462,972	513,504
Total	4,378,098	3,481,029	4,238,587

HALF-YEARLY PRODUCTION OF FOUNDRY PIG IRON.*

Massachusetts, Connecticut	4,292	2,302	3,087
New York, New Jersey	405,388	297,504	426,023
Pennsylvania	401,449	330,176	405,199
Maryland, Virginia, West Virginia	163,477	100,560	103,409
Kentucky, Mississippi	30,545	39,768	17,328
Tennessee	94,437	82,280	60,558
Alabama	577,139	645,970	529,159
Ohio	364,457	246,037	300,764
Indiana, Illinois	72,520	101,967	65,960
Michigan	160,248	126,445	164,984
Wisconsin	132,126	73,213	77,482
Minnesota, Missouri, Colorado, California	48,462	32,492	44,422
Total	2,454,540	2,078,714	2,207,375

* Includes ferro-silicon and a small quantity of silico-spiegel.

HALF-YEARLY PRODUCTION OF MALLEABLE PIG IRON.

New York	80,445	125,034	72,815
Pennsylvania	53,055	4,463	19,593
Kentucky, Ohio	110,568	65,251	102,136
Illinois, Michigan, Wisconsin	139,071	93,884	83,968
Total	383,139	288,632	278,512

HALF-YEARLY PRODUCTION OF FORGE PIG IRON.

New York, New Jersey	6,162	4,001	3,438
Pennsylvania	128,874	91,940	62,074
Virginia	3,192	7,997	2,673
Tennessee	1,652	1,534	380
Alabama	17,111	14,021	16,425
Ohio	40,492	44,675	53,799
Total	197,483	164,168	138,789

HALF-YEARLY PRODUCTION OF SPIEGELEISEN AND FERRO-MANGANESE.

Penna., Md., Ala., Illinois, Colo., Cal.	86,154	99,864	90,310
Total	86,154	99,864	90,310

HALF-YEARLY PRODUCTION OF OTHER GRADES.

New York, New Jersey	2,464	677	416
Pennsylvania	3,809	3,341	4,766
Virginia, Tennessee, Alabama	16,197	13,058	9,920
Ohio	3,109	3,014	4,770
Indiana, Illinois, Michigan, Wisconsin	454	3,613	732
Total	26,033	23,703	20,604

PIG IRON MADE FOR SALE OR FOR USE OF MAKERS IN THE FIRST HALF OF 1915.

States.	For sale.	For maker's use.	Total. Gross tons.
Massachusetts, Connecticut	2,487	600	3,087
New York, New Jersey, Maryland	626,760	380,479	1,007,239
Pennsylvania	887,626	4,311,795	5,199,421
Virginia, West Virginia, Alabama	811,164	200,799	1,011,963
Kentucky, Tennessee	123,796	46	123,842
Ohio	672,720	2,291,491	2,964,211
Indiana, Illinois	171,552	1,266,102	1,437,654
Mich., Wis., Minn., Mo., Col., Cal.	359,061	127,313	486,374
Total.....Gross tons.	3,655,165	8,578,625	12,233,791

Production of Steel Ingots, Castings and Finished Materials in 1914

(Statistics compiled by American Iron and Steel Institute)

PRODUCTION OF STEEL INGOTS AND CASTINGS.

PRODUCTION OF STEEL INGOTS AND CASTINGS BY PROCESSES, GROSS TONS, 1900–1914.

Years	Open-hearth. Basic.	Open-hearth. Acid.	Open-hearth. Total.	Bessemer.	Crucible.	Electric.	Miscellaneous.	Total. Gross tons.
1900.	2,545,091	853,044	3,398,135	6,684,770	100,562	.....	4,862	10,188,329
1901.	3,618,993	1,037,316	4,656,309	8,713,302	98,513	.....	5,471	13,473,595
1902.	4,496,533	1,191,196	5,687,729	9,138,363	112,772	.....	8,386	14,947,250
1903.	4,734,913	1,094,998	5,829,911	8,592,829	102,434	.....	9,804	14,534,978
1904.	5,106,367	801,799	5,908,166	7,859,140	83,391	.....	9,190	13,859,887
1905.	7,815,728	1,155,648	8,971,376	10,941,375	102,233	.....	8,963	20,023,947
1906.	9,658,760	1,321,653	10,980,413	12,275,830	127,513	.....	14,380	23,398,136
1907.	10,279,315	1,270,421	11,549,736	11,667,549	131,234	.....	14,075	23,362,594
1908.	7,140,425	696,304	7,836,729	6,116,755	63,631	.....	6,132	14,023,247
1909.	13,417,472	1,076,464	14,493,936	9,330,783	107,355	13,762	9,185	23,955,021
1910.	15,292,329	1,212,180	16,504,509	9,412,772	122,303	52,141	3,194	26,094,919
1911.	14,685,932	912,718	15,598,650	7,947,854	97,653	29,105	2,844	23,676,106
1912.	19,641,502	1,139,221	20,780,723	10,327,901	121,517	18,309	2,853	31,251,303
1913.	20,344,626	1,255,305	21,599,931	9,545,706	121,226	30,180	3,831	31,300,874
1914.	16,271,129	903,555	17,174,684	6,220,846	89,869	24,009	3,622	23,513,030

PRODUCTION OF STEEL INGOTS, 1900–1914.

1900.	2,502,447	718,197	3,220,644	6,678,303	96,573	.....	6	9,995,526
1901.	3,524,052	830,635	4,354,687	8,706,538	94,586	.....	214	13,156,025
1902.	4,384,129	935,721	5,319,850	9,125,815	107,817	.....	2,833	14,556,315
1903.	4,600,034	829,529	5,429,563	8,574,730	97,025	.....	3,395	14,104,713
1904.	5,007,448	597,884	5,605,332	7,843,089	79,083	.....	2,172	13,529,676
1905.	7,609,569	835,267	8,444,836	10,919,272	96,500	.....	2,572	19,463,180
1906.	9,345,212	915,310	10,260,522	12,243,229	117,170	.....	3,510	22,624,431
1907.	9,912,839	890,372	10,803,211	11,634,276	121,001	.....	989	22,559,477
1908.	6,985,420	539,532	7,524,952	6,096,196	55,360	.....	519	13,677,027
1909.	13,111,467	781,429	13,892,896	9,296,969	94,672	13,456	786	23,298,779
1910.	14,858,353	782,805	15,641,158	9,354,437	107,671	50,821	.....	25,154,087
1911.	14,419,306	608,153	15,027,459	7,890,753	83,623	27,227	417	23,029,479
1912.	19,197,504	712,371	19,909,875	10,259,151	100,967	14,147	542	30,284,682
1913.	19,884,465	805,250	20,689,715	9,465,200	103,655	20,973	587	30,280,130
1914.	15,936,985	633,382	16,570,367	6,154,964	78,683	15,458	312	22,819,784

PRODUCTION OF STEEL CASTINGS, 1900-1914.

1900.	42,644	134,847	177,491	6,467	3,989	.....	4,856	192,803
1901.	94,941	206,681	301,622	6,764	3,927	.....	5,257	317,570
1902.	112,404	255,475	367,879	12,548	4,955	.....	5,553	390,935
1903.	134,879	265,469	400,348	18,099	5,409	.....	6,409	430,265
1904.	98,919	203,915	302,834	16,051	4,308	.....	7,018	330,211
1905.	206,159	320,381	526,540	22,103	5,733	.....	6,391	560,767
1906.	313,548	406,343	719,891	32,601	10,343	.....	10,870	773,705
1907.	366,476	380,049	746,525	33,273	10,233	.....	13,086	803,117
1908.	155,005	156,772	311,777	20,559	8,271	.....	5,613	346,220
1909.	306,005	295,035	601,040	33,814	12,683	306	8,399	656,242
1910.	433,976	429,375	863,351	58,335	14,632	1,320	3,194	940,832
1911.	266,626	304,565	571,191	57,101	14,030	1,878	2,427	646,627
1912.	443,998	426,850	870,848	68,750	20,550	4,162	2,311	966,621
1913.	460,161	450,055	910,216	80,506	17,571	9,207	3,244	1,020,744
1914.	334,144	270,173	604,317	65,882	11,186	8,551	3,310	693,246

PRODUCTION OF MERCHANT BARS.

PRODUCTION OF MERCHANT BARS, SHOWING IRON AND STEEL MERCHANT BARS SEPARATELY, GROSS TONS, 1905–1914.

Years.	Iron.	Steel.	Total.	Years.	Iron.	Steel.	Total.
1905...	1,322,439	2,271,162	3,593,601	1910.	1,074,163	2,711,568	3,785,731
1906...	1,481,348	2,510,852	3,992,200	1911.	835,625	2,211,737	3,047,362
1907...	1,440,356	2,530,632	3,970,988	1912.	944,790	2,752,324	3,697,114
1908...	685,233	1,301,405	1,986,638	1913.	1,026,632	2,930,977	3,957,609
1909...	952,230	2,311,301	3,263,531	1914.	563,171	1,960,460	2,523,631

PRODUCTION OF CONCRETE BARS.

PRODUCTION OF CONCRETE BARS, SHOWING IRON AND STEEL CONCRETE BARS SEPARATELY, GROSS TONS, 1909–1914.

Years.	Iron.	Steel.	Total.	Years.	Iron.	Steel.	Total.
1909...	.....	159,352	159,352	1912.	2,500	271,832	274,332
1910...	4,645	236,464	241,109	1913.	113	319,557	319,670
1911...	2,388	256,353	258,741	1914.	.....	288,471	288,471

PRODUCTION OF ROLLED IRON AND STEEL.

TOTAL PRODUCTION OF ALL KINDS OF FINISHED ROLLED IRON AND STEEL, 1887–1914.

Years	Iron and steel rails. Gross tons.	Plates and sheets, except nail plate.	Wire rods. Gross tons.	Structural shapes, not including plates.	Nail plate. Gross tons.	Bars, skelp, and all other forms.	Total. Gross tons.
1887.	2,139,640	603,355	.....	.....	308,432	2,184,279	5,235,706
1888.	1,403,700	609,827	279,769	.....	289,891	2,034,162	4,617,349
1889.	1,522,204	716,496	363,851	.....	259,409	2,374,968	5,236,928
1890.	1,885,307	809,981	457,099	.....	251,828	2,618,660	6,022,875
1891.	1,307,176	678,927	536,607	.....	223,312	2,644,941	5,390,963
1892.	1,551,844	751,460	627,829	453,957	201,242	2,579,482	6,165,814
1893.	1,136,458	674,345	537,272	387,307	136,113	2,104,190	4,975,685
1894.	1,021,772	682,900	673,402	360,305	108,262	1,795,570	4,642,211
1895.	1,306,135	991,459	791,130	517,920	95,085	2,487,845	6,189,574
1896.	1,122,010	965,776	623,986	495,571	72,137	2,236,361	5,515,841
1897.	1,647,892	1,207,286	970,736	583,790	94,054	2,497,970	7,001,728
1898.	1,981,241	1,448,301	1,071,683	702,197	70,188	3,239,760	8,513,370
1899.	2,272,700	1,903,505	1,036,398	850,376	85,015	4,146,425	10,294,419
1900.	2,385,682	1,794,528	846,201	815,161	70,245	3,575,536	9,487,443
1901.	2,874,639	2,254,425	1,365,934	1,013,150	68,850	4,772,320	12,349,327
1902.	2,947,933	2,665,409	1,574,293	1,300,326	72,936	5,383,219	13,944,116
1903.	2,992,477	2,599,665	1,503,455	1,095,813	64,102	4,952,185	13,207,697
1904.	2,284,711	2,421,398	1,699,028	949,146	61,601	4,597,497	12,013,381
1905.	3,375,929	3,532,230	1,808,688	1,660,519	64,542	6,398,107	16,840,015
1906.	3,977,887	4,182,156	1,871,614	2,118,772	54,211	7,383,828	19,588,468
1907.	3,633,654	4,248,832	2,017,583	1,940,352	52,027	7,972,374	19,864,822
1908.	1,921,015	2,649,693	1,816,949	1,083,181	45,747	4,311,608	11,828,193
1909.	3,023,845	4,234,346	2,335,685	2,275,562	63,746	7,711,506	19,644,690
1910.	3,636,031	4,955,484	2,241,830	2,266,890	45,294	8,475,750	21,621,279
1911.	2,822,790	4,488,049	2,450,453	1,912,367	48,522	7,316,990	19,039,171
1912.	3,327,915	5,875,080	2,653,553	2,846,487	45,331	9,908,475	24,656,841
1913.	3,502,780	5,751,037	2,464,807	3,004,972	37,503	10,030,144	24,791,243
1914.	1,945,095	4,719,246	2,431,714	2,031,124	38,573	7,204,444	18,370,196

PRODUCTION OF TINPLATES AND TERNE PLATES

PRODUCTION OF TINPLATES AND TERNE PLATES, 1891–1914.

Years.	Tinplates.	Terne plates.	Total pounds.
1891 (second 6 months).....	368,400	1,868,343	2,236,743
1892 (calendar year).....	13,921,296	28,197,896	42,119,192
1893.....	64,536,209	59,070,498	123,606,707
1894.....	102,223,407	64,120,002	166,343,409
1895.....	165,927,907	88,683,488	254,611,395
1896.....	270,151,785	89,058,013	359,209,798
1897 (first 6 months).....	203,028,258	49,545,643	252,573,901
1897 (second 6 months).....	.....	.....	322,205,619
1898 (calendar year).....	.....	.....	732,289,600
1899.....	.....	.....	808,360,000
1900(cen. yr. end. May 31)...	707,718,239	141,285,783	*850,004,495
1901 (calendar year).....	.....	.....	894,411,840
1902.....	.....	.....	806,400,000
1903.....	.....	.....	1,075,200,000
1904 (cen. yr. end. Dec. 31)...	867,526,985	158,857,866	*1,032,940,706
1905 (calendar year).....	.....	.....	1,105,440,000
1906.....	1,100,373,000	193,367,000	1,293,740,000
1907.....	996,650,000	156,447,000	1,153,097,000
1908.....	1,048,896,000	154,179,000	1,203,075,000
1909.....	1,179,858,000	190,930,000	1,370,788,000
1910.....	1,450,821,000	168,184,000	1,619,005,000
1911.....	1,597,629,000	158,441,000	1,756,070,000
1912.....	1,965,659,000	191,396,000	2,157,055,000
1913.....	1,708,186,000	136,944,000	1,845,130,000
1914.....	1,939,785,000	146,195,000	2,085,980,000

* Revised. Include 1,000,473 pounds in 1900 and 6,555,855 pounds in 1904 of "other sheet iron and sheet steel, tin or terne plated."

PRODUCTION OF SKELP

Years.	Iron.	Steel.	Total.	Years.	Iron.	Steel.	Total.
1905...	452,797	983,198	1,435,995	1910.	350,578	1,477,616	1,828,194
1906...	391,517	1,137,068	1,528,585	1911.	322,397	1,658,276	1,980,673
1907...	444,536	1,358,091	1,802,627	1912.	327,012	2,119,804	2,446,816
1908...	297,049	853,534	1,150,583	1913.	312,746	2,189,218	2,501,964
1909...	370,151	1,663,230	2,033,381	1914.	264,340	1,718,091	1,982,431

Big Export Inquiries Before Trade

Frank Searle, New York City, is Asking Prices on About 1,000 Tools—Lull is Felt in Chicago Market

THE MACHINE tool market continues to be featured by a large demand from abroad. As has been the case in previous weeks, however, the volume of business that is closed is not nearly as large as could be done were the dealers and manufacturers not booked so far ahead on the tools most in demand. Some exceedingly large export inquiries now are before the trade. One of the most important is that put out by Frank Searle, 25 Broad street, New York, who is co-operating with J. P. Morgan & Co. Mr. Searle has put out inquiries for prices on something like 1,000 tools. The Bartlett-Hayward Co., Baltimore, is making large purchases of different kinds of equipment to be installed in the large extension to its plant it has under way, as previously reported in *The Iron Trade Review*. Bids have gone in on a list of approximately 40 tools put out early last week by the Lehigh & New England railroad; this equipment is to be installed in the new shops which that road is erecting at Pen Argyle, Pa. It is understood a large list of tools is to be submitted in the near future by the International & Great Northern railroad, which will erect new shops near San Antonio, Texas.

A good many crane inquiries now are being worked on quietly in the east. The Halcomb Steel Co., Syracuse, N. Y., has purchased a 30-ton Pawling & Harnesfeger crane. The American Smelting & Refining Co. has purchased two 10-ton, 90-foot span cranes for installation at Tacoma, Wash. Among concerns in the east who are expanding their capacity are the American Machine & Foundry Co., Brooklyn, N. Y.; Rochester Welding Works, Rochester, N. Y.; Gilbert & Barker Mfg. Co., West Springfield, Mass.; Seneca Falls Mfg. Co., Seneca Falls, N. Y.; American Tube Works, Somerville, Mass.; New Departure Mfg. Co., Bristol, Conn.; Cutaway Harrow Co., Higganum, Conn.; Risdon Tool & Machine Co., Naugatuck, Conn.; Sun Motor Co., Buffalo, and others.

New Equipment in Great Demand at Pittsburgh

PITTSBURGH machine tool dealers, literally "swamped" with orders, are devoting about 50 per cent of their time at plants of builders attempting to obtain shipments. Some middlemen are in a position to offer nearly all types of tools for delivery the latter part of the year, but shipments gradually are becoming more deferred. Demand for equipment for the manufacture of war material continues to feature the market. Within the last few days, 125 lathes have been sold for export to one of the belligerent nations and numerous inquiries for similar shipment are pending. Manufacturers of war material are beginning to discard old equipment and are entering the market for new machinery. If demand for munitions continues at its present rate, much of the equipment now in operation will be either sold at low prices or "scrapped" before the end of the year. The Pittsburgh Valve Foundry & Construction Co., Pittsburgh, is reported to be in the market for considerable shrapnel-making machinery.

Tool Trade Slackens Pace at Chicago

SLACKENING of business in machine tools characterizes the Chicago market for the present, although conditions are not bad. The lull probably is natural after the activity that preceded it for several weeks. Foreign demand has nearly cleared warehouse floors of the sort of tools used in munition-making and large shipments have been forwarded recently. Domestic demand, aside from that arising from concerns with war orders, is small. Recent increases of price have resulted in domestic buyers keeping out of the market unless driven by absolute necessity as prices and deliveries both are adverse.

Present prices of new tools and demand for second-hand machinery have had the effect of causing owners of used tools to ask fantastic prices in many cases and thus close the market to themselves. This desire to participate in the wave of higher price materially narrows the supply of available second-hand material that can be turned over to meet present demand. Taking of munition orders by a number of Chicago manufacturers has caused considerable buying and some of this is of machines on which delivery will not be made until toward the end of the year, buyers finding they cannot obtain anything sooner.

Export Demand Strong at Cincinnati

IN CINCINNATI demand for machine tools from Europe again is very much in evidence. At the beginning of the war the majority of tools sold were for European delivery, but during the past six months sales have been mostly to plants in this country which are making shrapnel and other munitions of war. European buyers have again come to the front and several good lists for lathes are pending from Italy and France, the former aggregating about $75,000 and the latter about $50,000. Machine tool makers in Cincinnati, however, have orders too far ahead to guarantee the deliveries wanted by these countries. The American Tool Works Co. is enlarging its plant by using the old adjoining Greenwald foundry building, which it purchased recently. Machine tool builders in Hamilton, O., have taken orders from the French government recently, aggregating $500,000.

EASTERN STATES

LEICESTER, MASS.—L. S. Watson Mfg. Co. has let contract for a 3-story and basement, 24 x 74-foot addition.

MILLBURY, MASS.—Charles Buck Edge Tool Co. has been sold to Buck Bros., manufacturers of edge tools. The business of the two plants will be combined.

SOMERVILLE, MASS. — American Tube Works, manufacturing copper seamless tubing, has started work on a 1-story addition, 178 x 248 feet, to be used as a rolling mill.

SPENCER, MASS.—Spencer Wire Co. considers adding a tinning mill to its present plant.

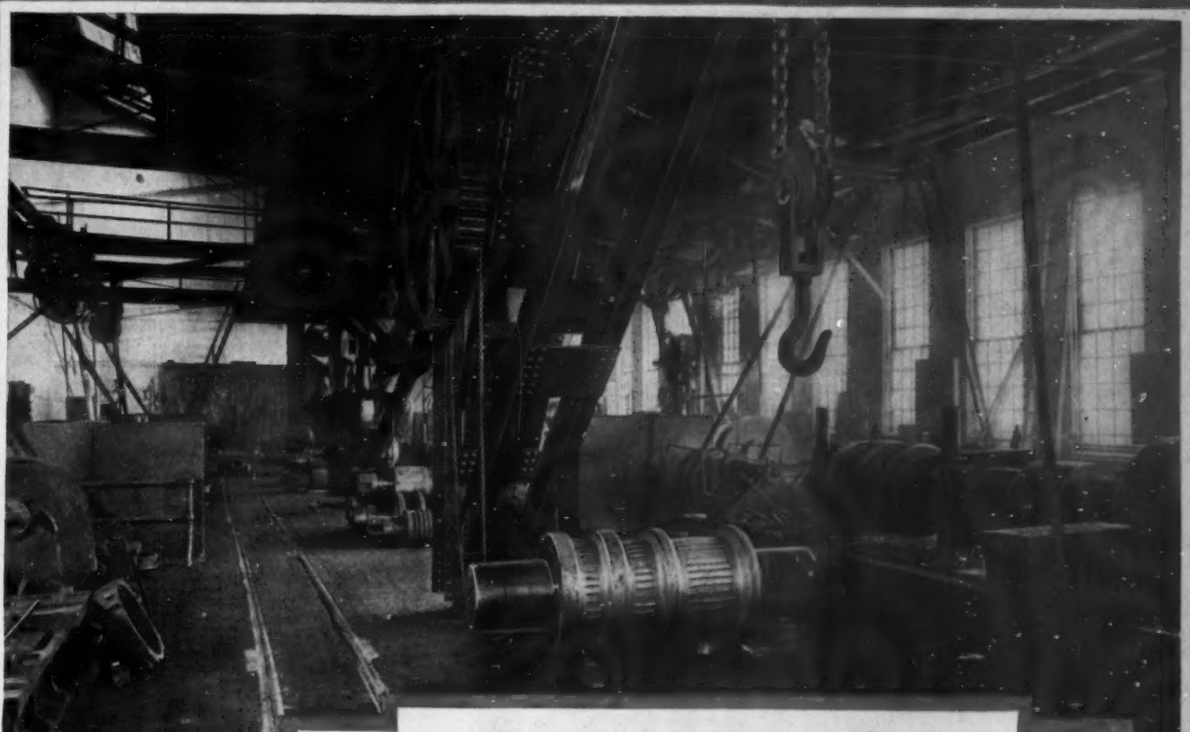
WEST SPRINGFIELD, MASS.—Gilbert & Barker Mfg. Co. has let contract for a 2-story, 65 x 100-foot addition, to be used for laboratory and office purposes.

WORCESTER, MASS. — Worcester Brush & Scraper Co. has been incorporated; $25,000 by Gilbert C. Bemis, president and treasurer; Raymond B. Fletcher, and Edward F. Fletcher.

WORCESTER, MASS.—P. E. Semers, Lagrange street, is taking bids on a 1-story, 36 x 141-foot addition to his tack factory.

WORCESTER, MASS. — Heald Machine Co. has received bids on a 1-story and basement, 150 x 175-foot addition.

WORCESTER, MASS. — Norton Grinding Co. will erect a brick and steel addition to



AMERICAN STEEL & WIRE CO.
CLEVELAND, O.

THIS SHOWS HOW THESE BLOCKS ARE LAID. THE FLOOR BECOMES IRONED OUT BY USE INTO A DENSE, SOLID, SMOOTH, UNIFORM MASS.

Men Who Know Best Say This is the Best Floor

¶ There are three of these Ayer & Lord Wood Block Floors in the Newburgh Steel Works of the American Steel & Wire Co.

¶ All of the foremen and men say they are "satisfactory, indeed." The engineer of the works says, "very likely the best floor for shop purposes that we know of."

¶ That is a comprehensive endorsement from men who know. Engineer, foremen and men all of the same mind about this floor.

¶ Of course, they spoke of the

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INTERIOR WOOD BLOCK FLOOR

¶ Look at the test this particular floor was put to with these great rolls piled upon it. Where another type of floor would be chewed up, would disintegrate, crumble, or corrugate — these Ayer & Lord Wood Blocks only become firmer, smoother and more compact. The wood fibre irons out under excessive weight and use until the whole floor is one solid, welded mass.

¶ Ayer & Lord Interior Wood Blocks are easily removed for a track installation, pipe laying or machinery foundation —can be quickly replaced undamaged and the floor surface instantly restored. These floors are always warm, dry and comfortable. They get more efficient service from workmen and considerably reduce truck labor.

¶ The adaptability of Ayer & Lord Interior Wood Blocks to any kind of floor service means you can employ them profitably in foundry or shop.

Ayer & Lord Wood Block Floors
have proved they
—carry the heaviest loads
—stand the hardest wear
—resist fire and heat
—don't swell or buckle
—don't damage tools
—are dustless, noiseless, dry and sanitary
—are easy on the feet.

Write us for new booklet "FLOORS"

It contains further information—photographs of installations of every character. Tell us something of your problems —our Engineering Department will gladly advise and specify to suit your conditions without any obligation being incurred.

Ayer & Lord Tie Co.

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KANSAS CITY, MO.
1117 Rialto Building
MEMPHIS, TENN.
142 Exchange Building
PHILADELPHIA, PA.
319 Perry Building

AYER & LORD TIE CO. INCORPORATED — AYER & LORD INTERIOR — Always Easy on the Feet — WOOD BLOCKS — RAILWAY EXCHANGE, CHICAGO

8

its plant in Greendale. Traveling cranes and new equipment will be installed.

WORCESTER, MASS.—P. E. Somers, tack manufacturer, plans a 1-stroy, 40 x 150-foot addition to the plant at 35 Lagrange street.

WORCESTER, MASS. — Crompton & Knowles loom works will build a 1-story addition to the foundry on Grand street. Capacity will be increased from 60 to 100 tons a day. When finished, the work now being done at the old Star foundry will be transferred and that plant closed.

BRIDGEPORT, CONN. — Ready Tool Co. has filed a certificate at Hartford, Conn., showing change of location from New Haven, Conn., to Bridgeport.

BRISTOL, CONN.—New Departure Co. will erect a 1-story, 60 x 100-foot addition to the hardening shop; 1-story, 80 x 90-foot addition to the annealing shop, and a 1-story, 50 x 50 addition to the press room.

HARTFORD, CONN.—Jacobs Mfg. Co., manufacturer of chucks, will build a 3-story, 42 x 106-foot brick factory building.

HARTFORD, CONN.—Maxim Silencer Co. will remove its plant from west armory of Colt's Patent Fire Arms Mfg. Co. to new building of Reinhold Hakewessell, where it will occupy second floor. Plans have been made for addition to be erected as soon as company desires it. Owner considers the erection of two more stories, and, when completed, the Maxim company will have first call. Hiram P. Maxim, president, plans delivery of 100,000 automobile silencers in 1916. A large part of these will be sent abroad to be used on war trucks.

HIGGANUM, CONN. — Cutaway Harrow Co. will erect a 1-story office building, 40 x 50 feet, and also a factory building, 50 x 120 feet.

NAUGATUCK, CONN.—Risdon Tool & Machine Co. has commenced work on a 1-story, 20 x 100-foot addition.

SOUTHINGTON, CONN.—Town has voted to sell Peck, Stowe & Wilcox Co.'s plant at Plantsville, Conn., to Thompson Drop Forge Co., which will use it for expansion of business.

STAMFORD, CONN.—Motor Products Co. has been incorporated; $100,000, by Allen Sheldon, president; Richard K. Green, Parke D. Whitton, Floyd B. Bertram, and Elliott Savage, Meriden, Conn.

WATERBURY, CONN. — Waterbury Tool Co. plans additional buildings. The first plans are for the power house.

PAWTUCKET, R. I. — Phillips Insulated Wire Co. plans rebuilding plant on Central avenue and Freeman street. The proposed building will be a 3-story, 70 x 100-foot brick and steel structure.

BROOKLYN.—By-Products Reclaiming Co., 129 Front street, is about to start work on a 1-story, 100 x 150-foot plant.

BROOKLYN, N. Y.—Speery Gyroscope Co. starts construction of 11-story concrete plant at Flatbush avenue and Chapel street.

BROOKLYN.—American Machine & Foundry Co., 200 Fifth avenue, New York, has let contract for the erection of a 4-story, 72 x 700-foot addition to its plant here.

BUFFALO.—Sun Motor Co., R. Crawford, manager, 662 Ellicott square, has let contract for a 1-story, 100 x 500-foot automobile factory.

LOCKPORT, N. Y.—Covert Motor Vehicle Co. has let contract for a 3-story and basement, 44 x 96-foot factory building.

PORT CHESTER, N. Y.—Wilfred Hall Laboratories, F. R. Davis, manager, has let contract for a 3-story, 83 x 103-foot chemical factory.

ROCHESTER, N. Y.—Rochester Welding Works has let contract for a 36 x 68-foot building.

SENECA FALLS, N. Y.—Seneca Falls Mfg. Co., manufacturer of machine tools, plans a 2-story addition to contain 80,000 square feet floor space. Willard Case & Co., 17 Battery place, New York, architects.

CHESTER, PA.—Morton Crosby Co., contractor and dealer in foundry supplies, has been incorporated; $15,000 capital stock; by C. M. Black, Edmund Rose, and Joseph A. Hinderhafer, all of Chester, Pa.

FLEETWOOD, PA.—Fleetwood Metal Body Works has begun excavating for a 2-story, 40 x 489-foot plant.

LEBANON, PA.—The mayor and counsel will receive bids until Aug. 18 for a sewage disposal plant consisting of grit chamber, pump house with centrifugal pumps, etc. Jas. H. Fuertes, 140 Nassau street, New York, is the engineer.

PHILADELPHIA.—The Bearings Co. has been incorporated; $10,000 capital stock; by Frank Stehele, Herman P. Schade, Cynwynd, Pa., and C. A. Keffer, Roxborough, Pa.

PHILADELPHIA.—L. H. Gilmer Co., 52 North Seventh street, is having plans prepared for a 2-story, 50 x 150-foot factory building.

WAYNESBORO, PA. — Landis Tool Co. plans a larger machine shop for manufacturing boring machines.

BLOOMFIELD, N. J.—Engineers Francisco & Jacobus, 200 Fifth avenue, New York, have let contract for a 1-story, 184 x 525-foot plant to be erected here for the International Arms & Fuse Co., 200 Fifth avenue, New York.

HOBOKEN, N. J.—Wasson Piston Ring Co., 1123 Clinton street, has received bids for the erection of a 2-story branch plant at New Brunswick, N. J.

JERSEY CITY, N. J.—C. Botjer & Sons, Inc., has purchased 11 lots on Jersey avenue and Eighteenth street, and will erect on the site an addition in which war material will be manufactured.

SOMERVILLE, N. J.—Manufacturers Sales Co. has been incorporated to manufacture stoves; $10,000 capital stock; by Michael Baum, Irving Baum, Somerville; Julius London, Chicago.

TRENTON, N. J.—Woolston Mfg. Co., manufacturer of chains, will build an addition to the plant on Genesee street.

TRENTON, N. J.—Hill Refrigerator Co. has received bids for the erection of a 1-story, 100 x 500-foot refrigerator plant.

TRENTON, N. J. — Duncan Mackenzie's Sons Co., iron founder, has contracted with David Pyle for addition to its plant on Hamilton avenue.

DOVER, DEL.—Southern Zinc & Mining Co. has been incorporated here with capital stock of $1,000,000, to acquire and operate zinc properties. The incorporators include Wm. M. Pyle, Geo. C. Stiegler and Lawrence W. E. McCarthy, of Wilmington.

WASHINGTON, D. C.—United States government will receive bids until Oct. 10 from Atlantic and Pacific shipbuilding corporations for six torpedo boat destroyers, to cost approximately $6,000,000. Bids for construction of 16 submarines will be received until Sept. 10 to cost about $8,000,000. Five will be built on the Pacific coast.

CENTRAL STATES

CANTON, O.—H. L. Hurst Mfg. Co. has increased its capital stock from $40,000 to $100,000. Company manufactures overhead spraying and irrigating systems.

CHICAGO JUNCTION, O.—Davis Metallic Rod Packing Co. has been incorporated; $25,000 capital stock; by J. L. Davis, W. M. Griffin, E. K. McMorris, A. Hastman and L. M. Funtner.

CINCINNATI.—The plant of Ideal Steel Wheel Co., Winton Place, a suburb, will probably be occupied by George Roller Bearing Co., of Hamilton, O. The factory will be fitted with machinery to manufacture roller bearings.

CLEVELAND.—Name of Yuster Axle Co. has been changed to Columbia Axle Co.

DAYTON, O.—C. C. Wilson plans a factory for manufacturing gasoline tractors. Buildings will be erected at once.

MARIETTA, O.—Introstile Mfg. Co., is in the market for metal-working machinery, being especially interested in machines for swedging ice pick points.

MARION, O.—Scott Engineering & Construction Co. has been incorporated; $20,000 capital stock; by M. A. Scott, E. L. Baldwin, J. H. Arnold, S. A. Scott and James I. Beatty.

PRAIRIE, O.—Stinger planing mill, Bradner, O., recently damaged by fire, will be rebuilt.

RAVENNA, O.—Hohawk Motor Truck Co. has been incorporated; $25,000 capital stock; by H. C. Bradley, president; H. C. Smith, secretary, and others.

SPRINGFIELD, O.—No additional equipment will be needed by Webster & Perks Tool Co., which has recently been purchased by interests from Toledo, O., and which will be moved to the Shuey power building.

FALMOUTH, KY.—William Frazier is purchasing equipment for a woodworking and machine shop.

LOUISVILLE, KY.—Alfred Struck Co. has the contract for the erection of a $160,000 building for speed Realty Co.

LOUISVILLE, KY.—Neville Bullitt, Keller building, is reported to be interested in forming a company for manufacturing knit goods.

LOUISVILLE, KY.—Board of park commissioners will purchase an automatic motor-driven centrifugal pump for drainage purposes. Harry S. Smith is business director.

MIDDLESBORO, KY.—Middlesboro Electric & Auto works, making a specialty of repairing coal mining machinery, will purchase additional equipment.

SHELBYVILLE, KY.—Kentucky Utilities Co. has let the contract for the filter plant to Jewel Filtration Co., of New York.

DAWSON SPRINGS, KY.—Dawson Light & Power Co. has been incorporated; $7,500 capital stock; by James Clark Jr., and others.

BROOKVILLE, IND.—Brookville Electric Co. has asked permission of the public utilities commission to issue $10,000 in bonds for an addition to its power plant.

AURORA, ILL.—Triumph Burner & Stove Co. has been incorporated to manufacture heating devices; $50,000; by C. W. Mummery, E. B. Groeschell and Louis F. Weize.

CHICAGO.—Wildman Boiler & Tank Co. has been incorporated and will continue the manufacture of boilers; $15,000 capital; plant is located at 3458 Archer avenue.

CHICAGO.—Western Valve Co. has been incorporated; $50,000 capital stock; by H. V. Conine, E. M. Ashcraft and Charles F. Rathbun.

CHICAGO. — D. J. Hauptman, 1307 City Hall Square building is to buildt a machine shop 75 x 125 feet at 1744 North Kolmar avenue. D. S. Clafter, 64 West Randolph street, is architect.

CHICAGO.—Marshall & Fox, architects, 38 South Dearborn street, are taking bids on

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"Agathon" not only stands for Quality but is Quality

Standard Alloy Steels

Special Steels
Rolled to your specifications

AGATHON STEELS
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Bars
Billetts

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Blooms

"A Mark of Merit"

"Agathon" is a Greek word for quality. Whatever is absolutely good is "Agathon". The word "Agathon" is used in both a moral and physical sense and denotes quality, honesty and moral principle.

"Agathon" Steels will serve your purpose best

The Central Steel Company
MASSILLON, OHIO

—Detroit Office—
326-27-28 Ford Building, F. Walter Guibert, Sales Manager

AGATHON AGATHON AGATHON AGATHON

the 11-story, $1,000,000 Edgewater Beach hotel, for a syndicate represented by Connery & Corbett, 331 South Michigan avenue.

CHICAGO.—D. W. Patter is to build a 1-story, $18,000 garage at 1123-29 Thorndale avenue. J. E. Pridmore is architect.

EAST PEORIA, ILL.—An ordinance has been passed for the construction of a water works system to cost $30,000.

EAST ST. LOUIS, ILL.—Plans are being prepared for the Pure Carbonic Co., for a factory building of one 40-foot story, 50 x 95 feet. Chatten & Hammond, 64 East Van Buren street, Chicago, are architects.

JOLIET, ILL.—Hukle Gas Engine Co. has been incorporated to manufacture gas engines; $50,000 capital stock; by J. F. Carroll, F. O. Jacobs and Artie C. Carlson.

ROCK ISLAND, ILL.—Foundry, core and grinding rooms of Blake Specialty Co. were damaged by a $10,000 fire.

DETROIT.—Northway Motor Co. is to build a $40,000 addition to its plant at 855 Hancock street.

FLINT, MICH.—City engineer is preparing plans for the construction of a bridge over Gilkey creek.

LANSING, MICH.—Reo Motor Car Co. is to build three additions to its plant at a cost of $250,000.

SPARTA, MICH.—Bonds for $12,000 have been voted for a municipal electric light plant.

DURAND, WIS.—Durand Light & Power Co. has increased its capital stock from $35,000 to $70,000. H. A. Miles, is general superintendent.

MADISON, WIS. — Union Transfer & Storage Co. has awarded the contract for a $150,000, 6-story, reinforced concrete warehouse to N. E. Brede Co., Chicago.

MADISON, WIS.—Work on the machine shop and storage house for Gisholt Machine Co. has been started. Machine shop will be a 1-story, brick and steel structure, 112 x 175 feet. Storage house will be a 1-story, 45 x 112-foot building.

MILWAUKEE.—Fitzsimons Steel Co. has been incorporated; $40,000 capital stock; by Edward L. Wolf, Ernest Prinz and George H. Gabel.

MILWAUKEE. — Milwaukee Machine Tool Co., Sixtieth avenue and Mitchell street, West Allis, is building a brick addition. The concern is owned by Kearney & Trecker, Milwaukee milling machine manufacturers.

MILWAUKEE.—Blackstone Apartment Co. plans a reinforced concrete apartment house, of 151 suites. It will have a steam heating system, one electric passenger and one electric freight elevator. Work will start in the fall. Leehouts & Guthrie are the architects.

MILWAUKEE.—Enterprise Iron Works has been reorganized by Robert Wottstein and Carl Broenen. Offices have been opened at 240 Madison street. Brass and bronze work ornamental iron and structural steel will be the output.

WEST ALLIS, WIS.—Milwaukee Machine Tool Co. is building an addition 75 x 114 feet. This is a subsidiary of Kearney & Trecker and increased business made the addition necessary.

WEST BEND, WIS.—West Bend Woolen Mills Co. will erect an engine and boiler room, 44 x 70 feet and a 56 x 100-foot addition to the mill.

JOPLIN, MO. — Campbell Machinery Co. has been incorporated; $6,000 capital stock; by J. B. Corby, J. E. Campbell and J. B Rood.

KANSAS CITY, MO.—Iron & Steel Preserving Co. has been incorporated; $50,000 capital stock; by J. W. Berry, F. C. Gay and A. R. Gibson.

KNOBNOSTER, MO. — Johnson County Light & Power Co. has been incorporated; $5,000 capital; by S. A. Kelley, Guy C. Cooley and James Ennis.

ST. LOUIS.—Weber Implement & Automobile Co. is building an addition to its plant.

ST. LOUIS.—Peerless Burner & Machine Co. is to build a $50,000 plant.

ST. LOUIS.—Gravois Foundry & Mfg. Co., recently incorporated, will erect a 1-story, steel building, 60 x 150 feet, and will manufacture castings and patterns.

ST. LOUIS.—J. M. Dunham & Co., Chemical building, are preparing plans for Joseph J. Foster, 410 Washington street, for a $100,000, 5-story, steel mercantile building.

ST. LOUIS.—Plans are being prepared by Hayner & Barrett, Century building, for a $200,000 5-story publishing building, steel frame, for the Pulitzer Publishing Co., 212 North Broadway.

CHARITON, IA.—Contract is to be let soon for a water works system costing $80,000. M. G. Hall, Centerville, Ia., is engineer.

MARSHALLTOWN, IA. — Minneapolis & St. Louis Railway is to spend $100,000 on yard improvements at Marshalltown. R. G. Kenly, Minneapolis, Minn., is chief engineer.

ORANGE CITY, IA.—Bids will be received until Sept. 6 for building a bridge on state line over the Sioux river, two miles south of Hudson, So. Dak.

OTTUMWA, IA. — Ottumwa Railway & Light Co. is to extend its line to Court Hill. Charles E. Fahrney, of Ottumwa, is chief engineer.

MINNEAPOLIS.—Bids will be received until Aug. 20 by G. H. Hayes, comptroller of the University of Minnesota at the office of G. A. Sandberg, purchasing officer, on two 350-horsepower return water tubular boilers and stokers.

ROCHESTER, MINN.—Bids will be asked soon for the construction of a $110,000 municipal electric light plant.

ROCHESTER, MINN.—Plans have been completed for a $125,000 municipal power house. C. L. Pillsbury, 805 Metropolitan Life building, Minneapolis, is engineer.

SOUTHERN STATES

PENSACOLA.—City commissioners plan a machinery building for the water works. Construction will start shortly.

DALLAS, TEX.—Plans will be ready in three months for a $135,000 bridge over Trinity river at Commerce street. J. F. Witt is county engineer.

FORT WORTH, TEX. — American Steel Post Co., John T. Evans, president, will build a plant with a capacity of 4,000 posts per day.

GALVESTON, TEX.—E. N. Caustuary is to build a $30,000 automobile assembling plant

HARRISBURG, TEX. — Texas Portland Cement Co., F. F. Bissel, president, is to build a cement plant on Houston ship canal.

LOCKHART, TEX.—Bids will be received soon by the City Water Works, Electric Light & Ice Co. for the construction of a $45,000 water system and electric light plant. W. B. Swearingen is president.

ROYSE CITY, TEX.—Royse City Ice & Electric Co. has been organized to build an electric light and ice plant costing $16,000, by J. T. Murphy, A. F. Davis and E. C. Murphy.

SAN ANTONIO, TEX.—International & Great Northern railroad has purchased 108 acres near here and expects to spend about $500,000 on new shops, a round house, etc.

LITTLE ROCK, ARK.—Chicago, Rock Island & Pacific railroad, C. A. Morse, chief engineer, Chicago, has plans ready for a $30,000 viaduct of steel and reinforced concrete, 70 feet long and 46 feet wide.

CHATTANOOGA, TENN.—Volunteer State Life Insurance Co. has announced plans for the erection of a $400,000, 10-story building.

CHATTANOOGA, TENN.—B. B. West, of the West Construction Co., plans an asphalt plant of a new type.

CHATTANOOGA, TENN.—The Chattanooga Handle Co. has leased a plant and is purchasing machinery to manufacture shovel and tool handles.

CLINTON, TENN.—Clinton Electric Light & Power Co. will buy boilers, engine, generator, switchboard and motors, in connection with a change from direct to alternating current. H. C. Amerine is superintendent.

COLUMBIA, TENN. — Columbia Water & Light Co. will receive bids shortly for the construction of a filtration plant. J. S. Robinson is secretary.

CROSSVILLE, TENN.—J. B. Johnson considers plans for a hosiery mill. A company is being organized with a capital stock of $10,000.

FAYETTEVILLE, TENN. — Elk Cotton Mills will purchase a low-pressure steam turbine and special spinning equipment for new addition.

JOHNSON CITY, TENN. — Clinchfield Products Co. plans $250,000 plant for the manufacture of chemical products. Henry Kaufman is superintendent.

KINGSPORT, TENN. — Kingsport Extract Corporation will purchase engines and other power equipment, as well as machine tools, for a large machine shop.

KNOXVILLE, TENN. — Ross & Republic Marble Co. will rebuild the mill recently damaged to the extent of $37,000 by fire.

MEMPHIS, TENN.—W. H. Thompson has organized the Thompson Electric Clock Co. to manufacture automobile clocks.

NORTH CHATTANOOGA, TENN.—Mayor Voigt has information regarding the establishment of an electric light plant. A bond issue is contemplated.

MARSHALL.—Bonds for $25,000 have been voted for an electric light and water plant.

OKLAHOMA CITY, OKLA. — Oklahoma City Bridge & Construction Co. has been incorporated to establish a fabricating plant; $225,000 capital; by H. F. Crawford, William O'Donnell and W. C. Hansen. Company is in the market for equipment.

TULSA, OKLA.—Bids will be received until Aug. 26 by the board of commissioners of Tulsa county for a reinforced concrete bridge over the Arkansas river consisting of 18 arch spans of 78 feet each with 30-foot roadway. Harrington, Howard & Ash are consulting engineers, Kansas City, Mo.

WESTERN STATES

BROKEN BOW, NEB.—New bids will be advertised for the proposed pumping plant and electric light plant, former bids being rejected. Charles F. Sturtevant, Holdredge, Neb., is engineer.

LAWRENCE, KAS.—Plans have been completed by Hedrick & Cochrane, consulting engineers, Kansas City, Mo., for a bridge over the Kaw river of reinforced concrete, costing $200,000. War department has approved plans and bids will be asked as soon as the state utilities commission approves.

LAWRENCE, KAS.—Bids will be received until Oct. 6 by H. Brocker, clerk of Douglas county, on a steel and reinforced concrete

bridge including six 132-foot spans, three 29-foot, and one 48-foot plate girder spans. Bridge is to be 900 feet long, 44 feet wide with 30-foot roadway.

NETAWAKA, KAS. — Bonds for $10,000 have been voted for building a municipal electric light plant.

SPEARVILLE, KAS. — Bonds for $25,000 have been voted for a proposed water works system.

WITCHITA, KAS.—Martin Metal Co. plans an addition. Company manufactures metal bodies.

ANACONDA, MONT.—Council has passed a resolution providing $43,000 for street ornamental lighting system.

MALTA, MONT.—Bids will be received until Sept. 8 by the United States reclamation service at Washington, D. C., for three 100-foot steel spans and a structural steel movable crest for Vandalia dam.

POISON, MONT.—Bonds have been voted for construction of an electric lighting system.

IDAHO FALLS, IDA. — Missouri Valley Bridge & Iron Co. has estimated $60,000 as the cost of a rim to rim bridge over Snake river.

ABERDEEN, WASH.—An election will be held soon on issuing bonds of $500,000 for the construction of the Wynoochee water system.

ABERDEEN, WASH. — Plans are being prepared for rebuilding the toll bridge over Chehalis river. Estimated cost is $15,000. C. E. Fowler, Central building, Seattle, engineer.

BELLINGHAM, WASH. — A $20,000 mill will replace stamps in Post Lambert property during the coming year. A generator will be installed at Silesia Creek Falls.

BELLINGHAM, WASH.—A ten stamp mill with a power plant, crusher and other equipment, will be installed by George Wingfield, Reno, Nevada, who is interested in Red Mountain Gold Mining Co.

HILLYARD, WASH.—Council has authorized $6,000 bond issue for water plant. Two electric motors and a standpipe will be installed.

KALAMA, WASH.—Mountain Timber Co.'s mill, recently damaged by fire, will be rebuilt.

SEATTLE.—Bids will be received about Sept. 1 for a 5-story building, 72 x 242 feet costing $500,000 or an 8-story building of same area to cost $850,000 for the Times Publishing Co. Bebb & Gould, Denny building, are architects.

SPOKANE, WASH.—Bids will be asked soon for a $75,000 machinery warehouse for the International Harvester Co.

STANWOOD, WASH.—George W. Kunze, Arlington, Wash., will erect a sawmill with a daily capacity of 100,000 feet.

WALLA WALLA, WASH. — Grova Cookerly, couny engineer, is preparing plans for a $18,000 steel bridge over the Walla Walla river at Swegle crossing.

PITTSBURG, CAL.—Columbia Steel Co. is to install an electric furnace and equipment for the production of small castings. D. H. Botchford is superintendent.

CANADA

TORONTO. — Creditvale Works, Ltd., has been incorporated to manufacture machinery; $100,000 capital stock; by G. W. Hammond and others.

REGINA.—Bids will be received until noon, Sept. 16, for furnishing a 7,000,000-gallon pumping unit. J. M. MacKay, superintendent of waterworks.

NEW CATALOGS

CONDENSERS.—A 32-page booklet is issued by the Southwark Foundry & Machine Co., Philadelphia, descriptive of its Weiss counter-current condensers. Several diagrams and views of this type of condenser are given. A list of installations is included.

MARINE ENGINES.—An attractive booklet of six pages and embossed cover is published by the Southwark Foundry & Machine Co., Philadelphia, manufacturers of the Southwark-Harris valveless Diesel type engine, descriptive of the performance of the yacht Southwark, first to be equipped with this power. It is said that this engine, rated at 240 horsepower, may be run at a fuel cost of 18¾ cents an hour.

CENTRIFUGAL PUMPS. — A series of five bulletins aggregating 44 pages has been issued by the Southwark Foundry & Machine Co., Philadelphia, descriptive of its line of Southwark-Rateau centrifugal pumping machinery. This includes multi-stage and single-stage types. The bulletins discuss in order the general subject of centrifugal pumps, the single-stage, the single-stage multi-impeller, and the multi-stage types, and give instructions for their use.

BUCKET DIGGERS.—The Brown Hoisting Machinery Co., Cleveland, describes its Shnable drag-line bucket in a 12-page pamphlet. Illustrations showing the apparatus in service, and diagrams of its operation are presented. This bucket is of the back-dumping type, and comprises a shell, pulling bail and combination hoisting bail and back-gate. With this bucket, it is claimed that grades do not require hand finishing. It is also said to work equally well on either a rising or descending slope. The Shnable bucket is manufactured in five types, ranging from 1 to 3½ cubic yards capacity. For rock work, it is manufactured in four types, ranging from 2 to 3½ cubic yards capacity.

PATTERN LETTERS AND FIGURES.—A 28-page catalog and price list of white metal and brass pattern letters and figures has been issued by H. W. Knight & Son, Seneca Falls, N. Y. This company also manufactures wood and leather fillets, steel letters and figures, dowels, rapping plates and branding irons. The white metal pattern letters furnished to the foundry trade by this company may be bent to conform to the contour of patterns or steel brads may be driven through them into the patterns for holding them in place. Interesting suggestions are included regarding the uses of pattern letters and the lettering that should appear on castings. Directions are given for sweating brass letters to iron patterns, as well as for fastening white metal letters to iron patterns Hand made steel letters are described, as well as soft lead gaskets, copper burning brands, etc. This catalog will prove a valuable addition to the business library of every foundry and pattern shop.

WELDING AND CUTTING EQUIPMENT.—The welding and cutting equipment built by the Prest-O-Lite Co., Indianapolis, is illustrated and described in a series of bulletins contained in a loose-leaf binder. One of these bulletins entitled "Fusion or Autogenous Welding" briefly describes the various processes of electric, oxy-hydric, oxy-coal gas and oxy-acetylene welding and cutting, with a chapter on metal cutting by oxygen. The welding apparatus built by this company is described in an eight-page bulletin and another bulletin of 20 pages points out how the cost of manufacturing may be lowered by repairing broken and worn equipment by oxy-acetylene welding and cutting. This bulletin contains a large number of interesting service views showing the application of the Prest-O-Lite equipment for welding rolled steel parts, cast iron and for cutting steel. Illustrations of a wide assortment of repairs made by this process are included, which reflect the wide adaptability of this equipment in various classes of work.

"He Who Hesitates is Lost"

"Lost" meaning that your ever-vigilant competitor has NAILED the business while you were "Getting Ready To". ACTION is the keynote! START SOMETHING!

Frank Searle, 25 Broad street, New York City, co-operating with J. P. Morgan & Co., has put out inquiries for prices on about 1,000 machine tools.

Defiance Iron Works, Chatham, Ill., is understood to be in the market for about $20,000 worth of machinery for the manufacture of shells.

Phoenix Iron Works Co., Meadville, Pa., has increased its capital stock from $200,000 to $300,000 and will erect a large building to house the plate shop, foundry and boiler departments, all of which will be enlarged.

Baton Rouge Electric Co., Baton Rouge, La., will purchase three 400-horsepower water tube boilers; three 500-kilowatt turbines and other equipment.

American Machine & Foundry Co., 200 Fifth avenue, Brooklyn, N. Y., has let a contract for a 4-story, 72 x 700-foot addition.

Cluley Multiplier Co., Chicago, manufacturer of adding, subtracting and dividing machines, has leased the plant of American Woodworking Machinery Co., Green Bay, Wis., for five years. The plant is being equipped with new set of machinery and tools including forges, presses, heat-treating furnaces, etc. John P. Cluley, superintendent.

Clinton Electric Light & Power Co., Clinton, Tenn., will buy boilers, engines, generator, switchboard and motors in connection with a change from direct to alternating current. H. C. Amerine, superintendent.

Middlesboro Electric & Auto works, making a specialty of repairing coal mining machinery, will purchase additional equipment.

Elk Cotton Mills, Fayetteville, Tenn., will purchase low-pressure steam turbine and special spinning equipment for an addition.

Bids will be asked about Sept. 1 for a $2,000,000 freight storage warehouse for the Pennsylvania Lines West. The building which is to be erected at Polk street, Chicago, will be five stories with a ground area of 500 x 800 feet. Price & McLanahan, architects, Bellevue Court building, Philadelphia, will receive bids.

Linde Air Products Co., New York, will erect a shop and distributing station in Milwaukee and $50,000 will be spent in equipping the plant which will be a 1-story, 150 x 250-foot brick and concrete structure.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery to Dec. 31.)

Bessemer, valley	$15.00
Bessemer, Pittsburgh	15.95
Basic, Pittsburgh	14.95
Basic, eastern Pa.	15.00
Malleable, Pittsburgh	14.20
Malleable foundry, Chicago	13.50
Malleable foundry, Philadelphia	15.25 to 15.50
Malleable foundry, Buffalo	13.50 to 13.75
No. 1X foundry, Philadelphia	15.25 to 15.50
No. 2 foundry, Pittsburgh	14.20
No. 2 foundry, valley	12.75 to 13.00
No. 2 foundry, Cleveland	14.00
No. 2 foundry, Ironton	13.50 to 14.00
No. 2 foundry, Chicago	13.50
No. 2X foundry, Philadelphia	15.00 to 15.25
No. 2X fdy., N. J. tidewater	14.75 to 15.00
No. 2X foundry, Buffalo	13.50 to 13.75
No. 2 plain, Philadelphia	14.75 to 15.00
No. 2 plain, N. J. tidewater	14.25 to 14.50
No. 2 plain, Buffalo	13.00 to 13.25
No. 2 southern, Birmingham	11.00
No. 1 southern, Cincinnati	13.90
No. 2 southern, Chicago	14.50 to 15.00
No. 2 southern, Phila. delivery	14.00 to 14.25
No. 2 southern, Cleveland	14.00
No. 2 south'n, New York docks	13.75 to 14.00
No. 2 southern Boston, docks	13.75 to 14.00
No. 2 south. interior, New Eng.	14.50 to 15.50
No. 2 southern, St. Louis	13.90 to 14.40
Virginia No. 2X furnace	12.50 to 13.00
Virginia 2X, Philadelphia	15.25
Virginia 2X, Jersey City	15.50
Virgina 2X, Boston points	15.75
Gray forge, eastern Pa.	14.25 to 14.50
Gray forge, Pittsburgh	13.70
Gray forge, Birmingham	8.75 to 9.00
Silveries, 8 per cent, Jackson, O.	16.00 to 16.50
Silveries, 5 per cent Birmingham	12.50
Silveries, 5 per cent, Chicago	16.35
Standard low phos., Phil.	21.50 to 22.00
Lebanon low phos., furnace	17.00 to 17.50
Low phos., Pittsburgh	20.95 to 21.20
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	15.75 to 16.25
Charcoal, Buffalo	15.75 to 17.00
Charcoal, Birmingham	21.50

IRON ORE

Lake Superior Ores.

(Lower lake ports.)

Old range Bessemer, 55 per cent.	$3.75
Mesabi Bessemer, 55 per cent.	3.45
Old range, non-Bess., 51½ per cent.	3.00
Mesabi non-Bessemer, 51½ per cent.	2.80

Foreign Ores.

(Per unit Philadelphia.)
(Prices nominal.)

Foreign Bess., 50 to 65 per cent.	8 to 8½c
For'n non-Bes., 50 to 65 per cent.	8 to 8½c

COKE

(At the ovens)

Connellsville furnace	$1.65 to 1.80
Connellsville fur. contr.	1.75 to 1.80
Connellsville foundry	2.00 to 2.50
Connellsville fdy. contr.	2.25 to 2.60
Wise county furnace	2.00 to 2.25
Wise county foundry	2.40 to 2.60
Pocahontas furnace	2.00 to 2.50
Pocahontas foundry	2.25 to 2.50
New River, foundry	2.50 to 3.25
New River, furnace	2.25 to 2.50

FERRO-ALLOYS

Ferro mang., furnace (prompt)	$95 to 100
Ferro mang., Balti. (future)	95 to 100
Ferro-silicon, 50 per cent, Pbgh.	73.00 to 75.00
Ferro-silicon, 50 per cent, Phila.	73.00 to 75.00
Ferro-sil., 12 to 13 per cent.	18.00 to 18.50
Ferro-sil., 11 to 12 per cent.	17.00 to 17.50
Ferro-sil., 10 to 11 per cent.	16.00 to 16.50
Ferro-sil., 9 to 10 per cent.	15.00 to 15.50

(Ferro-silicon quoted at furnace Ashland, Jackson and New Straitsville.)

Ferro-carbon titanium, carloads, per lb.	8c to 12½c
Ferro vanadium, Pbgh. per lb. alloy	$2.25
Ferro tungsten, per lb. of alloy	2.50
Ferro chrome, per lb., Niagara Falls	20c

SEMI-FINISHED STEEL

Open hearth billets, Phila.	$30.00 to 32.00
Forging billets, Phila.	34.00 to 36.00
Forging billets, Pbgh.	28.00 to 29.00

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive of insurance and dockage.

From New York	$0.45
From Pittsburgh	.619
From Youngstown	.619
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

Wire rods, Pittsburgh	$27.00
Bess. bill., Youngstown	22.00
Open hearth billets, Youngstown	22.50
Bessemer billets, Pittsburgh	23.00
Open hearth billets, Pittsburgh	24.00
Bess. sheet bars, Youngstown	23.00
Op. h'th sheet bars, Youngstown	24.00
Bess. sheet bars, Pittsburgh	24.00
Op. h'th sh. bars, Pbgh.	25.00
Muck bar, Pittsburgh	27.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh.	1.25c
Stand. open-hearth rails, Pbgh.	1.34c
Lgt. rails, 8-lbs., Pbgh. & Chgo.	1.22c
Lgt. rails, 12 lbs. Pbg. & Chgo.	1.17c
Lgt. rails, 16 to 20 lbs., Pgh. & Chgo.	1.12c
Lgt. rails, 25 to 45 lbs., Pbgh. and Chgo.	1.07c
Relaying rails, standard, Pbg. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect. Pbgh. base.	1.50c
Angle bars, st. sections, Chicago	1.50c
Spikes, railroad, Pbgh.	1.40c
Spikes, railroad, Chgo.	1.50c to 1.55c
Track bolts, Pbgh.	1.95c to 2.00c
Track bolts, Chgo.	2.00c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	3.00
New England	3.00
Philadelphia	2.79
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.00 to 1.50
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (rail and water)	4.25
Philadelphia (all rail)	5.20
Philadelphia (rail and water)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago, to:—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.47
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.30c
Structural shapes, Chicago	1.49c
Structural shapes, Philadelphia	1.459c
Structural shapes, New York	1.469c
Struc. shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.44c to 1.49c
Tank plates, Pittsburgh	1.30c
Tank plates, Philadelphia	1.459c
Tank plates, New York	1.469c
Bars, soft steel, Pittsburgh	1.30c
Bars, soft steel, Chicago	1.49c
Bars, soft steel, Philadelphia	1.459c
Bars, soft steel, New York	1.469c
Hoops, carloads, Pittsburgh	1.30c
Bands, Pittsburgh	1.30c
Shafting, Pbgh., contr.	60 to 65 off
Bar iron, Chicago	1.20c to 1.25c
Bar iron, Philadelphia	1.35c to 1.40c
Bar iron, New York	1.35c to 1.40c
Bar iron, Cleveland	1.20c to 1.25c
Bar iron, Pittsburgh	1.30c
Hard steel bars, Chicago	1.25c
Smooth finish, mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	1.85c to 1.90c
No. 28, black, Chicago	1.99c to 2.04c
No. 28, tin mill, black, Pbgh.	1.80c to 1.85c
No. 28, galvanized, Pbgh.	4.00c to 4.50c
No. 28, galvanized, Chgo., nom.	
No. 10, blue, anld., Pbgh.	1.35c to 1.50c
No. 10, blue, annealed, Phila.	1.559c to 1.609c
Tin plate, 100 lb., coke base.	3.10c to 3.20c

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickled, cold roll, and re-anl.	30 cents
Hot roll'd pick'd and anl., tin mill	25 cents
Full pickl'd, cold rolled and re-anl.	50 cents
Auto sheets	75 cents
Blued stove pipe stock	10 cents
Range steel	30 cents
Re-squarring	10 cents
Roller leveling	10 cents
Patent leveling and re-squarring	35 cents
Oiling sheets	10 cents
Deoxidizing	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free from mill scale	55 cents
Special open hearth deep stpg. steel free from mill scale	80 cents
Extra deep special auto body stock	$1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black. Butt-weld.	Galv. Butt-weld.
Steel, ¾ to 3 inches	79	57½
Iron, ¾ to 2½ inches	71	46
	Lap-weld.	
Steel, 2½ to 6 inches	78	62½

BOILER TUBES

Steel, 3½ to 4½ inches l. c. l.	72
Iron, 3½ to 4½ inches l. c. l.	61

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotation.)

Wire nail jobbers, Pittsburgh	$1.60
Plain wire, jobbers, Pittsburgh	1.40
Galvanized wire, jobbers, Pbgh.	2.20
Polished staples, Pbgh.	1.70
Galvanized staples, Pbgh.	2.50
Barb wire, painted, jobbers, Pbgh.	1.70
Barb wire, galv., jobbers, Pbgh.	2.50